

# **GRADES 3-5**

## **Overview**

In Grades 3-5, students are introduced to the full range of scientific knowledge in the domains of Physical Science, Life Science, and Earth and Space Science through content, processes, and application skills. Many content standards build upon prior knowledge while others introduce new concepts and skills. Concrete experiences remain important as students develop abstract-thinking abilities and extend their scientific knowledge. Manipulative skills become more refined, making possible more sophisticated measurement techniques and an expanded use of scientific equipment and technology. Teachers guide students to recognize the important role science plays in society and in the development of technology.

Students in Grades 3-5 are engaged in a learning environment that encourages exploration, inquiry, formulation of models, and application of results based on experiences. As in Grades K-2, such an environment increases opportunities to provide a solid foundation of scientific knowledge and experiences upon which understanding is built. Maintaining a scientific journal of investigations helps students organize experimental information, enhances their reading and writing skills, and allows time for reflection on scientific information and processes.

Students in these grades begin simple independent studies involving variables and increase their abilities to conduct group investigations and work as a team. Effective science instruction inspires their curiosity and encourages independent investigations and discoveries through student-generated questions. As the teacher plans for instruction, attention is given to identifying clear learning goals and providing developmentally appropriate activities that assist students in achieving these goals.

## THIRD GRADE

Students in Grade 3 are becoming more aware of scientific concepts. They are active, inquisitive, and have a greater interest in their environment and an increased capacity for intellectual growth. Through varied and appropriate activities, third-grade students begin to develop a sense of where they are in their world. Teachers extend the natural inclinations of students to ask questions and investigate their world through an inquiry-based classroom environment. In this learning environment, students apply process skills, engage in hands-on activities, and participate in cooperative groups to conduct investigations that begin with questions and progress toward the communication of answers.

The development of critical-thinking and problem-solving skills is a major goal of the third-grade science program. In Grade 3, the study of science includes planning and implementing simple classroom and field investigations. Students describe the layers of Earth, including the inner and outer cores, mantle, and crust. They observe the force and motion of objects, identify weather phenomena, organize weather data into tables or charts, describe the life cycle of plants, and determine the effect of environmental conditions on plant growth and survival.

### Physical Science

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Students will:

1. Classify substances as soluble or insoluble.  
Examples: soluble—sugar in water, powdered drink in water;  
insoluble—sand in water, oil in water
2. Identify physical and chemical changes of matter.  
Examples: physical—chopping wood,  
chemical—burning wood
3. Describe ways energy from the sun is used.  
Examples: plant growth, light, heat
  - Identifying fossil fuels as a source of energy
4. Define force and motion.
  - Identifying forces that change an object's position or motion  
Examples: lifting, pushing, pulling
  - Identifying sources of friction  
Examples: rubbing hands together, applying sandpaper to wood
  - Describing the force of gravity
5. Identify the relationship of simple machines to compound machines.  
Example: pencil sharpener composed of a wheel and axle, inclined plane, and wedge

## Life Science

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6. Identify structures and functions of the muscular and skeletal systems of the human body.
7. Describe the life cycle of plants, including seed, seed germination, growth, and reproduction.
  - Describing the role of plants in a food chain
  - Identifying plant and animal cells
  - Describing how plants occupy space and use light, nutrients, water, and air
  - Classifying plants according to their features  
Examples: evergreen or deciduous, flowering or nonflowering
  - Identifying helpful and harmful effects of plants  
Examples: helpful—provide food, control erosion;  
harmful—cause allergic reactions, produce poisons
  - Identifying how bees pollinate flowers
  - Identifying photosynthesis as the method used by plants to produce food
8. Identify how organisms are classified in the Animalia and Plantae kingdoms.
9. Describe how fossils provide evidence of prehistoric plant life.  
Example: plant fossils in coal or shale providing evidence of existence of prehistoric ferns
10. Determine habitat conditions that support plant growth and survival.  
Examples: deserts support cacti, wetlands support ferns and mosses

## Earth and Space Science

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11. Describe Earth's layers, including inner and outer cores, mantle, and crust.
  - Classifying rocks and minerals by characteristics, including streak, color, hardness, magnetism, luster, and texture
12. Identify conditions that result in specific weather phenomena, including thunderstorms, tornadoes, and hurricanes.
  - Identifying cloud types associated with specific weather patterns
  - Identifying positive and negative effects of weather phenomena  
Examples: positive—flooding deposits good soil when waters recede,  
negative—flooding kills crops
  - Identifying technology used to record and predict weather, including thermometers, barometers, rain gauges, anemometers, and satellites
  - Explaining symbols shown on a weather map
  - Organizing weather data into tables or charts
13. Describe ways to sustain natural resources, including recycling, reusing, conserving, and protecting the environment.
  - Recognizing the impact of society on human health and environmental conditions
14. Describe the position of Earth, the moon, and the sun during the course of a day or month.
  - Describing various forms of technology used in observing Earth and its moon

## FOURTH GRADE

Students in Grade 4 are often intrigued with science. They are able to use critical-thinking and problem-solving skills as well as scientific methods to plan and implement field and laboratory investigations. These students need to be involved in an active learning process that extends beyond the memorization of concepts to include application of knowledge and skills. Concrete experiences are important to students at this stage of development. Such experiences allow students to continue to build upon and strengthen skills learned in earlier grades as they progress to higher levels of cognitive reasoning.

The fourth-grade classroom includes an active learning environment that provides intellectually stimulating instruction and developmentally appropriate activities. Teachers incorporate activities that foster exploration and investigation, thus enabling students to communicate valid conclusions about their world.

As students in Grade 4 expand their conceptual understanding of science, they identify components and processes of the natural world. These include functions and uses of electricity; how light interacts with transparent, translucent, and opaque materials; the effects of friction; ways in which organisms grow and develop; and the appearance and movement of Earth and its moon.

### Physical Science

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Students will:

1. Describe how electrical circuits can be used to produce light, heat, sound, and magnetic fields.
  - Identifying ways to use and conserve electrical energy
  - Identifying characteristics of parallel and series circuits
  - Classifying materials as conductors, nonconductors, and insulators of electricity and heat
  - Identifying relationships among charge, current, and potential energy
  - Identifying components of a circuit
2. Compare different pitches of sound produced by changing the size, tension, amount, or type of vibrating material.
  - Describing the relationship between the structure of the ear and hearing
3. Recognize how light interacts with transparent, translucent, and opaque materials.

Examples: transparent—most light passes through,  
translucent—some light passes through,  
opaque—no light passes through

  - Predicting the reflection or absorption of light by various objects
4. Describe effects of friction on moving objects.
  - Identifying momentum and inertia as properties of moving objects
  - Identifying ways to increase or decrease friction

## Life Science

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5. Describe the interdependence of plants and animals.
  - Describing behaviors and body structures that help animals survive in particular habitats  
Examples: behaviors—migration, hibernation, mimicry;  
body structures—quills, fangs, stingers, webbed feet
  - Describing life cycles of various animals to include incomplete and complete metamorphosis  
Examples: damselfly, mealworms
  - Tracing the flow of energy through a food chain  
Example: producer, first-level consumer, second-level consumer, and third-level consumer
  - Identifying characteristics of organisms, including growth and development, reproduction, acquisition and use of energy, and response to the environment
6. Classify animals as vertebrates or invertebrates and as endotherms or ectotherms.
  - Describing the organization of cells into tissues, organs, and organ systems
  - Describing the grouping of organisms into populations, communities, and ecosystems
  - Classifying common organisms into kingdoms, including Animalia, Plantae, Protista, Fungi, Archaeobacteria, and Eubacteria

## Earth and Space Science

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7. Describe geological features of Earth, including bodies of water, beaches, ocean ridges, continental shelves, plateaus, faults, canyons, sand dunes, and ice caps.
8. Identify technological advances and other benefits of space exploration.  
Examples: laser, pacemaker, dehydrated food, flame-retardant clothing, global positioning system (GPS), satellite imagery, global weather information, diagnostic imagery
  - Listing highlights of space exploration, including satellites, manned moon missions, the unmanned Mars mission, and an inhabited space station
  - Identifying Alabama's contribution to the space industry
9. Describe the appearance and movement of Earth and its moon.
  - Identifying the waxing and waning of the moon in the night sky
  - Identifying lunar and solar eclipses
10. Describe components of our solar system.
  - Defining comets, asteroids, and meteors

## FIFTH GRADE

In Grade 5, concrete experiences remain important to students as they conduct scientific inquiries and include evidence of abstract ideas in their explorations. Students refine their abilities to identify variables and increase the accuracy of their predictions based on prior experiences and explanations based on information gathered.

Fifth-grade students need a positive learning environment that encourages and challenges their efforts and progress toward learning science. This environment is supported through active learning opportunities and content-related questions that foster science communication.

As fifth-grade students continue to explore the physical world, they develop detailed comparisons through investigations and hands-on experiences. Students form an understanding of the relationship between food chains and food webs, compare plant and animal cells, and become more knowledgeable about the forms and transfer of energy. They also begin to compare Earth to other planets in our solar system.

### Physical Science

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Students will:

1. Identify evidence of chemical changes through color, gas formation, solid formation, and temperature change.  
Example: combining vinegar and baking soda to produce a gas
2. Define mass, volume, and density.
  - Identifying the atom as the basic building block of matter
  - Relating temperature changes to particle motion  
Example: movement of colored dye in hot and cold water
  - Relating density to the sinking or floating of an object in a liquid
3. Use everyday indicators to identify common acids and bases.  
Examples: using grape juice to determine that vinegar is an acid, using juice from boiled red cabbage to determine that baking soda is a base
4. Describe forms of energy, including chemical, heat, light, and mechanical.
  - Identifying types of potential and kinetic energy  
Examples: potential—water behind a dam, battery;  
kinetic—water moving across turbine blades
  - Describing alternatives to the use of fossil fuels  
Examples: solar energy, geothermal energy, windmill, hydroelectric power, biomass
  - Identifying the transfer of energy by conduction, convection, and radiation  
Examples: conduction—hot plate heating a pan,  
convection—space heater heating air,  
radiation—sun heating Earth’s surface

5. Contrast ways in which light rays are bent by concave and convex lenses.
  - Describing how a prism forms a visible spectrum
  - Explaining why different objects have different colors
  - Describing how mirrors reflect light
    - Example: discussing differences in the reflection of light by convex and concave mirrors
  - Describing the relationship between the structure of the eye and sight
  - Identifying types of corrective lenses used to correct different sight problems
    - Examples: convex—farsightedness, concave—nearsightedness
  - Identifying the contribution of van Leeuwenhoek to the development of the microscope
6. Compare effects of gravitational force on Earth, on the moon, and within space.
  - Identifying contributions of Newton to the study of gravity
  - Describing how a spring scale is used to measure weight
  - Explaining how air resistance affects falling objects

## Life Science

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7. Identify common parts of plant and animal cells, including the nucleus, cytoplasm, and cell membrane.
  - Comparing unicellular and multicellular organisms
  - Comparing plant and animal cells
8. Identify major body systems and their functions, including the circulatory system, respiratory system, excretory system, and reproductive system.
9. Describe the relationship of populations within a habitat to various communities and ecosystems.
  - Describing the relationship between food chains and food webs
  - Describing symbiotic relationships

## Earth and Space Science

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10. Identify spheres of Earth, including the geosphere, atmosphere, and hydrosphere.
  - Describing technology used to investigate Earth
    - Examples: sonar, radar, seismograph, weather balloons, satellites
  - Describing the rock cycle
11. Compare distances from the sun to planets in our solar system.
  - Relating the size of Earth to the size of other planets in our solar system
  - Identifying technology used to study planets
    - Examples: Hubble telescope, space probes, Mars Exploration Rover