

# Guiding Preschool Learning in Science and Technology/Engineering

Young children are naturally curious. They wonder what things are called, how they work, and why things happen. The foundations of scientific learning lie in inquiry and exploration — these are the tools of active learning. Fostering young children’s sense of curiosity about the natural world around them can promote a lifelong interest in it. Scientific learning should not be limited to a particular “science time.” Early childhood teachers should look for opportunities to develop children’s understanding of scientific concepts in all content areas. To do so, children need to observe things first-hand as much as possible. The younger the children, the simpler and more concrete the activities need to be. Classrooms need to have scientifically accurate books about animals and their environments such as field guides, as well as fictional stories. In all activities, teachers should make sure they use, and encourage children to use, the precise language of science.

The skills and processes of inquiry and exploration are fundamental to all the sciences. At the early childhood level the processes of experimentation may require preparation of the classroom environment, routines and materials as well as attention to how children operate and utilize materials.

The **Earth and Space Sciences** describe the properties of the earth, ocean, atmosphere, and universe (what things are called; what they do; how they look, act, and react to various stimuli). It includes geology and astronomy.

- Geology deals with the formation of the earth, its layers, forms and substances. Although young children can observe, discuss, and visit features of the earth such as mountains, lakes, beaches, oceans, rocks, and fossils, their concepts are limited to those things they experience repeatedly.
- Astronomy deals with the universe beyond the earth’s atmosphere. Children can observe the cycle of day and night, the movement of the sun, the waxing and waning of the moon, and the stars in the sky.

The **Physical Sciences** investigate natural forces and the basic elements in natural substances.

- Physics is the study of matter, energy, motion and force. It deals with speed, leverage, balance, gravity, and mechanical systems. Young children can grasp these concepts through exploratory play — they drop a toy and watch it fall to the floor; their unbalanced tower of blocks falls over; a cork floats in the water table while a rock sinks. Many repeated experiences help children grasp that these are predictable phenomena.
- Chemistry deals with the composition, properties, and transformations of substances. For example, earth combined with water makes mud; play dough disintegrates in the water table; oil separates from salad dressing; sugar dissolves in liquid; food coloring combines with water. Through cooking, mixing, and art experiences, children can observe how chemical transformations take place through heat, moisture, and combining substances.

The **Life Sciences** include the study of living things (what they are, how they survive, their life cycles, how they change). Young children need concrete experiences that enable them to observe, categorize, compare, and contrast living things. The three major components of the life sciences are biology, physiology, and ecology.

- Biology is the study of plants, animals, their structure, origin, growth, and reproduction.
- Physiology deals with the processes and functions of living things. Children learn about these concepts by identifying parts of their bodies, learning about their five senses, and observing a variety of living creatures and plants.
- Ecology deals with relationships between living things and their environment. Children can be taken on nature walks to see how living things have adapted to different environments.

**Technology/Engineering** involves finding out how things are constructed and work, and thinking about what can make them work differently/better. Science tries to understand the natural world; the goal of engineering is to solve practical problems through the development of technologies. Technologies developed through engineering include the systems that provide our houses with water and heat; roads, bridges, tunnels, and the cars that we drive; airplanes and spacecraft; cellular telephones; televisions and computers; many of today’s children’s toys, and systems that create special effects in movies.

Preschool children can begin to develop concepts in engineering as they design, build, and test solutions through their play — as they construct sand castles and build cities out of blocks. They can also begin to understand that tools help people do things better or more easily, or do some things that could otherwise not be done at all.



# Technology & Engineering

## Learning Guidelines

**23. Explore and describe a wide variety of natural and man-made materials through sensory experiences.**

*Link to Safe and Proper Use of Materials 1.1, 1.2*

**24. Demonstrate and explain the safe and proper use of tools and materials.**

*Link to Safe and Proper Use of Tools and Materials standard 1.3*

**25. Explore and identify simple machines such as ramps, gears, wheels, pulleys, and levers through play experiences.**

*Link to Design 2.1*

**26. Observe and describe ways that animals, birds, and insects use various parts of their bodies to accomplish certain tasks and compare them to ways people would accomplish a similar task.**

*Link to Framework: Engineering Design 2.2*

## Ideas for Learning Experiences

- feel and use a variety of natural (e.g., wood, cotton, fur, wool, stone, leather) and human-made materials (e.g., plastic, styrofoam, paper) to learn their characteristics and capabilities.
  - talk about which materials are natural and which are human made.
  - construct structures with various materials to determine which do/don't work to achieve the desired purpose (e.g., glue, tape; paper, cardboard, foam, plastic, wood; straws, spools).
  - express hypotheses about why certain materials are/are not appropriate for making various objects (e.g., "What is the table made of? Why is it made of wood and not styrofoam?").
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- invent and construct simple objects or structures using common tools and materials in a safe manner (e.g., wood, glue, scissors, rulers, pencils, sandpaper, hammer, etc.).
  - describe or demonstrate the reasons for wearing goggles or rules for safe use of tools or materials.
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- play with ramps and vehicles in the block area; pulleys in the sand table.
  - play with manipulative toys that use gears.
  - construct something that meets their needs (e.g., use building panels to construct a fort to sit in; a parking garage for vehicles out of blocks).
  - examine a common machine (e.g., hand food grinder) and discuss what it does and how it works.
  - find examples of simple machines such as ramps, wheels, gears, pulleys, and levers in the environment.
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- observe the ways animals use parts of their bodies compared to humans (e.g., some birds have a hooked bill that they use to open seeds; a person might use a nutcracker to accomplish a similar task; an animal might tear food apart with its teeth; a person would use a knife and fork).
  - act out animal behaviors (e.g., the way a bird or squirrel eats nuts/seeds; the way a dog laps water).

