

**ACTON PUBLIC SCHOOLS**

**GRADE FOUR SCIENCE PROGRAM**

**Experiments With Plants**  
**(Life Science)**

**Key Questions**

- How are plants different from non-living things?
- How do plants get the energy and nutrients they need? Do they need oxygen?
- What are the life cycle and the main parts of flowering plants? (review)
- How can scientists determine if a plant is a member of an identified species? Do you think scientists know about every kind of plant in the world?
- Do some plants have special features which help them live in their habitat?
- How can both living and nonliving things affect plant growth?
- Can plants ever affect their surroundings?
- Why do some plants need insects?

**Concepts**

1. Plants require nutrients; can make their own food through photosynthesis; can grow, reproduce, and die.
2. Plants are living organisms and have characteristics that differentiate them from non-living things.
3. Plants go through predictable life cycles.
4. Plants have different structures; these serve different functions that contribute to the well being of the whole organism and to the success of its offspring.
5. There are millions of kinds of plants; the number of species is not known.
6. Plants are classified on the basis of similarity of appearance (plants of the same species would have similar leaves, flowers, etc.).
7. Different plants have features that help them live and reproduce in different habitats. Some plants require insects (or other animals) to assist with pollination.
8. Individual plants of the same species differ in some of their characteristics; sometimes the difference can give the plant an advantage in surviving and reproducing.
9. All plants need some basic chemical building blocks, including water and oxygen. Plants carry out respiration (breathing) and require oxygen, not CO<sub>2</sub>, to breathe.
10. Sometimes plant populations can change their environment. Some changes are beneficial; others are detrimental.
11. Decomposers play an important role in food webs. (Review from grade 3)

## **Skills**

### ***Students will***

1. use simple tools to extend observations (ex.: students will use a hand lens to observe seeds, root hairs and buds on a plant; students will use a ruler to measure plant growth);
2. design and carry out a simple controlled experiment with growing plants;
3. communicate experimental results in writing and through drawings;
4. ask questions (both investigable and non-investigable) about their plant experiments as the unit progresses;
5. interpret findings by relating one factor to another;
6. describe observations through discussions, drawings, graphs, and writing.

## **Outcomes**

### ***Students will***

1. compare a living plant and a nonliving thing;
2. demonstrate an understanding of the life cycle of a plant;
3. identify the main parts of a plant and describe their functions;
4. identify a variety of plants that they have seen and state that others are waiting to be discovered in places that have not been investigated;
5. compare several similar plants and identify the characteristics that are in common – proving it is a member of the same species;
6. compare plants from a variety of habitats and state how their features help them survive;
7. describe the differences they observe in plants of the same species, and then describe how some of these differences have an effect on the survival of the plant and the number of seeds it can reproduce;
8. explain the special living requirements that plants need;
9. describe how plants get the energy and nutrients they need;
10. explain how plants make their own food from sunlight using the process of photosynthesis;
11. describe nonliving factors that can affect plant growth, such as: light, temperature, water, wind, soil composition, pollution, etc.;
12. describe how living organisms can affect the growth of plants;
13. explain the interdependence of a flowering plant and an insect (pollination should be included);
14. describe the positive and negative effects of plant populations on their environment.

## **Recommended kit/materials**

*Experiments With Plants*, Science and Technology For Children (STC) kit, National Science Resources Center, Smithsonian Institution, 1994. (Carolina Biological Supply Company)

## Land and Water (Earth/Space Science)

### Key Questions

- What are the different materials that make up soil? (Review from grade 3)
- How can water be a solid, a liquid, or a gas?
- What happens in the water cycle?
- What can happen to water when it runs downhill?
- How do people use technology or teamwork to solve environmental problems? (How can you plan a dam that can protect a community? How can you change a landscape to prevent damage to a community?)
- Is new technology always good for the environment?

### Concepts

1. The Earth's surface is composed of water, rocks, soils, and living organisms. (Review)
2. Rocks come in many different sizes, from boulders to grains of sand and smaller. (Review)
3. Materials can exist in different states, including solid, liquid, and gaseous. There are different characteristic properties of materials in each state. (Review)
4. Some events in nature have a repeating pattern. (Review)
5. Water flows downhill in streams and rivers, or accumulates in lakes and puddles and seeps into the ground.
6. There are design processes that can be used to solve technological problems.
7. Technology can have both positive and negative impacts on the environment.

### Skills

#### *Students will*

1. learn to model erosion, deposition, and the water cycle with a stream table;
2. use a stream table to investigate the interactions between water and land;
3. communicate the results of an investigation through record sheets, written observations and drawings.

### Outcomes

#### *Students will*

1. be able to explain that soil is made up of weathered materials and organic material; soil components include sand, silt, clay, gravel and humus;
2. be able to list at least two characteristics of each state of water;
3. be able to describe the water cycle, including the processes of evaporation, condensation, precipitation, and the passage of water over land;
4. state that water flows downhill and understand that it can form streams and rivers, accumulate in lakes and puddles, seep into the ground, or evaporate;

5. write up a design that includes the information listed below; carry out the design and revise it. The design must include:
  - ~ a statement that identifies the problem,
  - ~ a list of the materials used,
  - ~ a plan for the solution,
  - ~ a picture/diagram and words to describe the diagram,
  - ~ an evaluation of the solution to determine if it meets the goals,
  - ~ a statement of ways to improve the solution;
6. explain how humans can affect erosion and deposition in various ways – including clearing the land, planting vegetation, and building dams;
7. explain some of the positive effects people have on the environment;
8. ask questions both investigable and non-investigable about objects and events observed;
9. use materials to investigate a problem and ask questions such as “How?,” “Why?,” and “What would happen if . . .?”;
10. make predictions about the changes in the land based on prior experiments;
11. use a stream table to create dams and determine which design would help prevent destruction of a town;
12. plan the best location of plants to help deter erosion;
13. describe/communicate observations through discussions, drawings, graphs and writing.

### **Recommended kit/materials**

*Land and Water*, Science and Technology For Children (STC) kit, National Science Resources Center, Smithsonian Institution, 1996. (Carolina Biological Supply Company)

## **Astronomy** **(Earth/Space Science)**

### **Key Questions**

- What is the universe and how is the solar system organized?
- What causes night and day?
- Why does the moon seem to change?
- What causes the seasons?

### **Concepts**

1. The universe is vast and still being studied by scientists. Our solar system is part of the universe.
2. Our solar system is made up of a number of components – one star (the Sun), planets, moons, comets, and asteroids.
3. The Earth rotates on its axis once every 24 hours, causing apparent movement of the Sun, Moon and stars.

4. The revolution of the Earth around the Sun every 365 days, along with the tilt of the Earth, causes the change of seasons.
5. The Moon's revolution around the Earth causes us to observe different phases of the moon.

### **Skills and Knowledge**

#### ***Students will***

1. observe shadows as well as objects in the sky;
2. collect data (e.g., of shadows, the moon, the movement of the stars);
3. use the Internet – students will be able to access information from appropriate web sites.
4. examine and illustrate that the earth is one of several planets that orbit the sun and that the Moon orbits around the earth;
5. describe ways in which the Sun, Moon, planets, meteors, clouds, and other objects in the sky can be identified by properties such as size, shape, color, and movement;
6. represent an understanding that the Sun provides light and heat and is the cause of Earth's weather and the source of almost all of Earth's energy;
7. observe and explain why the Sun can be seen only in the daytime, but the Moon can be seen sometimes at night and sometimes during the day; know that because the earth rotates, the Sun, Moon, and stars all appear to move slowly across the sky;
8. observe and illustrate why the Moon looks a little different every day but looks the same again about every four weeks;
9. describe the universe as space and everything in it.

### **Recommended kit/materials**

*Solar System*, Scholastic Science Place, 1995.

*Earth, Moon and Stars*, GEMS guide (Great Explorations in Math and Science), Lawrence Hall of Science, University of California at Berkeley.

*One Small Square of Night Sky* by Donald Silver, Learning Triangle Press (McGraw-Hill) 1998. ISBN 0-07-58045-6

*My Place in Space* by Robin Hirst, Roland Harvey and Sally Hirst. ISBN: 053105859X

## Weather (Earth/Space Science)

*“Weather,” an interdisciplinary study, is integrated into the social studies units entitled “Exploration” and “North America Regions.” (Other curricular connections may include the science units “Land and Water” and “Astronomy.”)*

### Key Questions

- What is weather?
- What are the different forms of precipitation?
- How do global patterns such as the jet stream and water currents influence weather?
- What is the difference between weather and climate??

### Concepts

1. Weather influences the way we live – what we wear, what we eat, the landscape of the area we live in, our forms of transportation, even how we feel.
2. Weather is determined for a particular time in a particular place.
3. The sun is the engine that drives weather on Earth.
4. The components of weather are the sun, Earth, water, and air. Different combinations and interactions of these components determine the weather.
5. Air has weight (pressure), air moves (wind), air changes temperature, and air holds moisture.
6. Weathering helps to shape the land (precipitation and wind).
7. Climate is the average weather conditions (precipitation and temperature) in a particular region over a long period of time.

### Skills

#### *Students will*

1. learn to record daily weather using a thermometer, barometer, and Beaufort Scale;
2. observe and identify clouds (cirrus, cumulus, stratus) to predict precipitation;
3. read and interpret a weather map.

### Outcomes

#### *Students will understand that*

1. weather is what is happening in the air around us in a particular place at a particular time, and weather changes from day to day and over the seasons;
2. meteorologists use tools to measure aspects (factors) of weather such as air temperature, air pressure, the amount of moisture in the air, and the presence or absence of wind and clouds;
3. the Sun controls Earth's weather – different areas of the world have different weather and climates because of the revolution and tilt of the Earth;
4. moisture hovers in the sky in the form of clouds; when clouds become heavy, the water drops to the ground as precipitation;

5. depending on the temperature, precipitation takes the form of rain, snow, sleet, or hail; during the night the moisture in the air cools and covers everything with dew or frost;
6. bands of high winds called jet streams go around Earth from west to east because of the rotation of the Earth, and ocean currents (flow of water) follow the direction of the prevailing winds and affect both the climate of the world and our daily weather;
7. climate is the average weather conditions (precipitation & temperature) in a particular region over a long period of time (at least 30 yrs). It is affected by latitude, continentality, ocean currents, elevation, mountains, and prevailing winds.

**Recommended materials and resources**

*Introduction to Weather*, National Geographic Reading Expeditions: Earth Science

*Weather and Climate*, National Geographic Reading Expeditions: Earth Science

*Weather*, Kids Discover

*Watching the Weather* Series by Heinemann

*DK Eye Wonder: Weather*

*Discoveries: Weather* (Barnes & Noble Books, New York, NY)

*Eyewitness Books: Weather*

*Scholastic Atlas of Weather*