ACTON PUBLIC SCHOOLS

GRADE FIVE SCIENCE PROGRAM

Ecosystems
(Life Science)

Key Questions

- What are ecosystems? Why are they important?
- What is pollution? How does it affect plants and animals in an ecosystem?
- What are the living and non-living factors which affect ecosystems? How are these factors interdependent?
- How does energy move through an ecosystem?

Concepts

1. An *ecosystem* is a community of organisms and its interaction with its environment.
2. Organisms can be categorized by the functions they serve in an ecosystem – *producers, consumers,* or *decomposers* – as well as by their characteristics, such as fish and invertebrates.
3. Organisms in an ecosystem have *dependent* and *interdependent* relationships, which can be illustrated by *food webs*.
4. Factors that affect growth and reproduction of organisms in an ecosystem include light, water, temperature, and soil.
5. Natural and human-made events can disturb an ecosystem.
6. A pollutant is anything that can harm living organisms when too much of it is released into an ecosystem. Pollution is the condition that results when pollutants interact with the environment.
7. Pollutants can affect the stability of an ecosystem; solutions can be developed by people to minimize or alleviate the effects of pollutants.
8. Model ecosystems can be used to learn more about the complex relationships that exist on earth.
9. Energy flows through an ecosystem. Energy is trapped by producers and transferred to the consumers.

Opportunities for Review

1. The water cycle (evaporation, condensation, precipitation and collection/storage) is easily observed in a completed ecocolumn. (Transpiration through plants is an optional concept.)
2. Photosynthesis is the process by which green plants use the sun's energy, carbon dioxide and water to make their own food.
3. Soil is made up of several components, including decayed plants and animals, weathered rocks and minerals.
4. Animals can be classified into groups (vertebrates: mammals, birds, reptiles, amphibians and fish; and invertebrates, including insects and crustaceans), depending on their physical characteristics.

5. States of matter (solids, liquids and gasses) can be observed in the ecocolumns; i.e., liquid (water), gasses (O/CO2) and (through discussion) in water. This could be reviewed during the discussions of the following:
    - Oxygen/carbon dioxide cycle.
    - Food chains/webs.
    - Water cycle.

Skills

Students will:

1. Focus a hand lens and use pH paper, measuring devices, and other testing equipment.
2. Conduct, record, and organize daily observations.
3. Plan, implement, and analyze experiments and draw conclusions from the results.
4. Make and test predictions.
5. Identify ecosystems as stable or disturbed and recognize whether the causes of a disturbed ecosystem are natural or man-made.
6. Read for more information about ecosystems and pollution.
7. Communicate information through writing, drawing, and discussion.
8. Apply previously learned information to analyze a problem and suggest solutions.

Attitudes

Students will:

1. Develop sensitivity toward living things and understand that human behavior can positively or negatively affect them.
2. Respect evidence from an experiment and recognize that evidence can inform a decision.
3. Develop interest in investigating ecosystems.
4. Recognize the importance of repeating experiments to get valid results.

Recommended kit/materials

Ecosystems, Science and Technology for Children (STC) kit, National Science Resources Center, Smithsonian Institution, 1994. (Carolina Biological Supply Company)

Simple Engineering
(Physical Science/Design Technology)

Key Questions

- What are the basic simple machines?
- How do simple machines provide advantages in our lives?
- What are the processes by which people develop, analyze and improve the world through engineering?

Concepts

1. A *force* is any push or pull on an object. An *unbalanced force* is needed to make a resting object move, to bring a moving object to rest, or to change the direction of a moving object.
2. *Effort* is the force applied to move a load using a simple machine.
3. *Friction* is a force that occurs when two surfaces rub together. Friction can oppose motion.
4. *Simple Machines* are any of the six elementary devices that provide mechanical or other advantage.
5. *Complex machines* use two or more simple machines in an integrated way.
6. *Energy* is the ability to cause motion or create change.
7. *Engineering Design* requires creative thinking and strategies to solve practical problems generated by needs and wants. (Engineering 2.0)*

Skills

Students will:

1. Identify and define six simple machines: pulley, wedge, lever, wheel and axle, inclined plane, screw. (Gears are optional.) (Gr. K-2/Eng. 2.1)
2. Build prototypes from technical two-view drawings (Eng. 2.3).
3. Design, build, test, and modify prototypes to meet design requirements.
4. Identify and explain the appropriate materials and tools to construct a given prototype safely (Eng. 1.2).
5. Identify a problem that reflects the need for shelter, storage, or convenience (Eng. 2.1).
6. Describe different ways in which a problem can be represented; e.g., sketches, diagrams, graphic organizers, and lists (Eng 2.2).
7. Identify relevant design features (e.g., size, shape, weight) for building a prototype of a solution to a given problem (Eng. 2.3).
8. Communicate results of an investigation through record sheets, written observations, drawings, and class discussions.

**** Words in parenthesis refer to the MA Science Curriculum Framework.***

Attitudes

Students will:

1. Appreciate that simple machines are everywhere.
2. Understand the importance of patience and persistence in the design process.
3. Value the importance of engineering in the world.
4. Understand that scientists and engineers need to be precise.

Recommended kit/materials

Levers and Pulleys, FOSS (Full Option Science System), Lawrence Hall of Science, Berkeley, CA. (Delta Education)

Transport Systems
(Life Science)

Key Questions

1. What is a transport system?
2. In what ways is the digestive system a transport system?
3. In what ways is the respiratory system a transport system?
4. In what ways is the circulatory system a transport system?
5. What are the major organs of the digestive, respiratory, and circulatory systems?
6. What are the functions of the major structures of the digestive, respiratory, and circulatory systems?
7. How do nutrition, rest, and exercise affect the health of these transport systems?

Concepts

1. A transport system is a system within the body that changes materials and moves them throughout the body.
2. The major structures of the digestive system are: mouth, salivary glands, esophagus, stomach, pancreas, gall bladder, small intestine, large intestine, liver, rectum, and anus.
3. Two functions of digestion and absorption are mechanical changes and chemical changes.
4. Mechanical changes are the physical changes in the state of food such as chewing.
5. Chemical changes are the break down of bonds in food produced by enzymes and acids.
6. Peristalsis is the automatic downward muscle contraction, which moves food throughout the system.
7. Proper nutrition, rest, and exercise are key to sustaining a healthy digestive system.

8. The major structures of the respiratory systems are: nose, nasal cavity, mouth, epiglottis, larynx, pharynx, trachea, lungs, bronchial tubes, alveoli, capillaries, and diaphragm.
9. To allow air into the lungs, the diaphragm contracts and flattens. To expel air, the diaphragm and chest muscles relax.
10. Complications of the respiratory system include: colds, asthma, bronchitis, pneumonia, emphysema, and cancer.
11. Smoking is the number one cause of complications to the respiratory system.
12. Environmental factors including pollution (air) and exposure to toxic substances (asbestos) adversely affect the respiratory system.
13. Proper nutrition, rest, and exercise are key to sustaining a healthy respiratory system.
14. The major structures of the circulatory system are: heart, arteries, veins, capillaries, white and red blood cells, aorta, vena cava, atria, ventricles, valves, pulmonary artery, and pulmonary vein.
15. Blood flows to the heart through the vena cava, into the right atrium, right ventricle, and then through the pulmonary artery to the lungs. Oxygenated blood returns to the left side of the heart through the pulmonary veins, into the left atrium, left ventricle, and then out through aorta, where it is moves to all parts of the body.
16. Proper nutrition, rest, and exercise are key to sustaining a healthy circulatory system.

Skills

Students will:

1. Conduct, record, and organize daily observations.
2. Plan, implement, and analyze investigations and draw conclusions from the results.
3. Read for more information about the three systems.
4. Communicate through writing, drawing, and discussion.
5. Apply previously learned information to make connections about how the transport systems work together.

Attitudes

Students will:

1. Develop an understanding of how choices can affect the health of the human body.
2. Respect evidence from investigations and recognize that evidence can inform a decision.
3. Develop interest in investigating the human body.

Recommended kit/materials

See the Transport Systems binder, which includes overview, pre-assessment, readings, activities, investigations, assessments, supplemental materials list, and websites.