ACTON PUBLIC SCHOOLS

GRADE SIX SCIENCE PROGRAM

Microworlds
(Life Science)

Key Questions

1. What is magnification, and how can we use magnifiers to observe living and non-living things?
2. Where are micro-organisms found in nature?
3. How do living things and non-living things interact in their environment?
4. Where are micro-organisms found, and what are some of the different types of micro-organisms?

Concepts

1. In order to magnify, a *lens* must be transparent and curved.
2. *Magnification* is directly related to how much a lens is curved.
3. Higher magnification reveals more detail in a smaller area of a specimen.
4. In light microscopes, lenses are combined to focus light and increase magnification. Some microscopes (stereoscope) use 3D – compare for uses – when would you use?
5. Scientists designed and used early microscopes to extend their observational ability and investigate their ideas.
6. Some living organisms are too small to see without magnification.
7. All living things are made of at least one *cell*.
8. When magnified, all cells have observable structures (plant cells vs. animal cells).
9. *Micro-organisms* are widespread in nature.
10. Bacteria are partly responsible for the decomposition of organic material over time.
11. Some bacteria are eaten by other micro-organisms.
12. Like all organisms, micro-organisms grow and reproduce, eat, excrete waste, and respire.
13. Micro-organisms have structures that help them survive in specific environmental conditions.
14. Changing environmental conditions promote the survival of some micro-organisms over others and therefore change microbial communities.

Skills

Students will:

1. Determine what kinds of objects can be used to magnify.
2. Use magnifiers, including hand lenses and microscopes, to observe living and nonliving specimens.
3. Use appropriate equipment/techniques to prepare microscope slides for viewing.

4. Use a microscope to observe basic cell structure in both plants and animals.
5. Communicate detailed observations through writing, drawing, and discussion.
6. Make measurements of small objects using hair-widths and millimeters.
7. Explore ways to slow movement of microscopic organisms for closer observations.

Attitudes

Students will:

1. Develop an interest in exploring microscopic specimens.
2. Recognize that micro-organisms have many of the same needs as other living things.
3. Develop an appreciation of the diversity and complexity of microbial life.
4. Develop an appreciation of the interactions between living things and between living things and their environment.

Recommended kit/materials

Microworlds, Science and Technology For Children (STC) kit, National Science Resources Center, Smithsonian Institution, 1992. (Carolina Biological Supply Company)

Energy Sources
(Physical Science)

Key Questions

1. What are some different forms of energy? (motion, heat, and solar)
2. How does energy move and change?
3. How can we measure and test the effects of energy in our environment?

Concepts/Skills

Students will:

1. Interpret changes that occur during an experiment as evidence of *interaction*.
2. Review the concept of *variable* and identify which variables influence the outcome of simple experiments.
3. Explore *energy transfer* by conducting controlled experiments and collecting data.
4. Investigate the concepts of *energy source*, *energy receiver*, and *energy transfer*.
5. Identify and describe evidence of energy transfer.
6. Identify energy transfer and *energy chains* in experiments.
7. Measure the temperature of a system by using a *Celsius* thermometer.
8. Quantitatively predict and compare amounts of heat transferred, as indicated by changes in temperature.
9. Investigate the concepts of *insulator*, *heat* and *temperature*.

10. Identify and control variables that affect the amount of energy transferred from one moving object to another.
11. Quantitatively compare the amount of *kinetic energy* transferred in different experiments.
12. Use controlled experiments to analyze the variables involved in *solar energy* transfer to water and *solar cells*.
13. Identify variables that affect the transfer of energy from hot water to the environment.
14. Investigate the use of insulators to prevent energy transfer.
15. Investigate the conversion of solar energy to electricity.
16. Describe and discuss some possible uses of solar energy.

Recommended kit/materials

Energy Sources, Science Curriculum Improvement Study, Delta Education, 1998.

Scientific Method and Engineering Design

(Physical Science)

Key Questions

1. What do scientists mean by "The Scientific Method"?
2. What is the "Engineering Design Process"?
3. What are the similarities and differences between the two methods?

Concepts

Students will understand:

1. The Scientific Method ("fair testing"; "testable questions"; "if/then statements"; "dependent/independent variables").
2. Scientists may not always use "the method" as it is written out, but their work always involves the components listed above.
3. The Engineering Design Process – building/evaluating/redesigning prototypes; evaluating/testing materials.

Skills

Students will:

1. Learn to plan and conduct experiments in which variables are controlled.
2. Predict and test how changing a variable affects the outcome of an experiment.
3. Interpret test results to draw conclusions about how changing variables affects the outcome of an experiment.
4. Solve "Design Challenges" using engineering principles.
5. Evaluate a design solution prototype, redesign and retest.
6. Communicate results through writing in notebooks; organizing information in charts, tables, and graphs; and discussion.

7. Read and research science materials for more information.
8. Apply previously learned concepts and skills to solve a problem.

Attitudes

Students will:

1. Develop an appreciation for the value of "fair testing" in the quest for scientific understanding.
2. Recognize the importance of repeating tests to validate results.
3. Recognize the importance of redesigning a prototype and selecting the appropriate materials in order to accomplish an engineering task.

Recommended kit/materials

Science and Engineering Kit, developed by Acton Public Schools 2004