The Department's Educational Philosophy

We believe that students should be exposed to the process of scientific inquiry so they can acquire and interpret scientific knowledge and begin to realize the wider applicability of scientific problem-solving methods. By exposing them to a variety of scientific disciplines, they become aware of the many possible directions in which this inquiry may lead.

Guiding Principles

- Problem-solving skills are central to science education.
- Students must be able to observe, hypothesize, collect and analyze data and formulate hypotheses.
- Students should be able to use or design a strategy for testing scientific concepts.
- A comprehensive science program will emphasize the interplay between the abiotic and biotic factors in the environment.
- Science is integrally related to mathematics.
- An effective science program builds students' ability to communicate accurately and precisely.
- An effective science program stresses both cooperative and independent learning.

GENERAL SCIENCE: GRADE 7

Course Frequency: Full-year course, five times per week
Credits Offered: None
Prerequisites: None

Background to the Curriculum

The curriculum is designed to teach science by thinking, sharing, and writing about what students do and discover. It is activity and inquiry based. The programs have many activities designed to challenge students' thinking skills while introducing them to realistic methods of science. It is supplemented by several texts from the SciencePlus and Science Explorer series.

The program emphasizes concept and skill development. The seventh-grade program has a language emphasis, while the eighth-grade focus is on process.

The curriculum meets most of the science strands of the current Massachusetts Science and Technology Frameworks.

Unit 0 – Scientific Method/Skills of Inquiry

Core Topics/Questions/Concepts/Skills

- How do we solve problems scientifically?
- What are the steps a scientist follows to solve a problem?
- How do you design a controlled experiment?
- How do you measure mass, volume and density?

Unit-End Learning Objectives

Students will learn to solve problems scientifically, design a controlled experiment, and measure mass, volume and density in the metric system. By the end of this unit, students should be able to do the following.

1] Understand what science is and what scientists do; identify the five steps of the scientific method and utilize them in designing an experiment.
2] Recognize an investigative question.
3] Make and record precise observations.

4] Use the five senses in making observations.
5] Differentiate between qualitative and quantitative observations.
6] Recognize the difference between observations and inferences.
7] Recognize that characteristic properties can be used to differentiate between different types of matter.
8] Recognize that density is a characteristic property, calculated by D=M/V.
9] Recognize the relationship of density to an object's ability to sink or float.
10] Understand the value of making hypotheses and formulating testable predictions.
11] Distinguish between cause and effect.
12] Use the "If…then…" form of hypotheses and identify the independent and dependent variable.
13] Understand the importance of controlling variables in experiments.
14] Draw logical conclusions.
15] Follow a format for construction of formal lab reports.
16] Produce repeatable procedures.
17] Construct data tables.
18] Construct graphs of data using independent and dependent variables.
19] Make measurement of length, mass, volume and density using the metric system.
20] Convert between smaller and larger units of the metric system.
21] Understand the concept of volume and how to determine volume.

Unit 1 – Interactions

Core Topics/Questions/Concepts/Skills

- How is energy transferred through a community?
- What are the roles played by plants and animals in a community?
- How and for what purpose do organisms interact?
- How do populations change over time?

Unit-End Learning Objectives

Students will focus on the roles played by plants and animals that make up different biological communities and how they interact. By the end of this unit, students should be able to do the following.

1] Identify interactions between biotic and abiotic factors in the environment.
2] Describe the differences between a habitat and a niche.
3] Define and compare commensalism, mutualism, and parasitism. Be able to identify relationships of each.
4] Identify and describe differences between producers, consumers, scavengers, and decomposers.
5] Identify and describe differences between herbivores, carnivores, and omnivores.
6] Be able to trace the energy flow from producers to top consumers through food chains and food webs.
7] Describe how a change in one part of the food web/chain affects other parts of the web.
8] Understand what is meant by the "range of tolerance" for a given abiotic factor in the environment.
9] Understand the effect of limiting factors on the organisms in an environment.
10] Explain what is meant by biological succession. Describe the changes that occur in these communities.
11] Understand the natural cycle of re-growth and diversification that occurs after a natural or man-made disaster.
12] Explain how populations of one organism affect the population of other organisms (either as predator/prey or two populations that share the same niche).
13] Discuss both short-term and long-term changes in an environment and their effects on living things.
14] Compare and contrast different biomes found on Earth.
15] Understand the impact of the loss of environmental diversity and the impact of introduced species on an ecosystem.

Unit 2 – Diversity of Living Things

Core Topics/Questions/Concepts/Skills

- Why does diversity exist?
- How do physical conditions that take place dictate the interactions that take place?
- How does natural selection provide the mechanism for evolution?
- How are organisms classified?

Unit-End Learning Objectives

This unit focuses on the diversity of living things, the reasons for diversity, and how scientists make sense of this diversity.

Students should be able to:

1] Know that living things exhibit diversity in size, shape, and physical structure.
2] Recognize the value of diversity of living things within all environments.
3] Understand that evolution by natural selection explains how the different features of a species change over generations as a result of changing environmental conditions.
4] Explain the effects of environment on natural selection.
5] Recognize the effect of natural selection on the differences among the finches of the Galapagos Islands as studied by Darwin.
6] Know that adaptations (including but not limited to camouflage and mimicry) are inherited features that enable organisms to survive and produce young.
7] Recognize that camouflage is an adaptation that enables an organism to blend in with its environment.
8] Recognize mimicry as an adaptation.
9] Identify adaptations that plants have made to survive in their respective environments.
10] Understand the concept of classification and that all life on Earth is grouped into six kingdoms: Archaebacteria, Eubacteria, Protists (Protista), Fungi, Plants (Plantae), and Animals (Animalia).
11] Describe the role Linnaeus played in devising the classification system.

Unit 6 – The Restless Earth

Core Topics/Questions/Concepts/Skills

- How does the Earth's surface change over time through the mechanism of plate tectonics?
- How are rocks formed, changed, and reformed?
- How are fossils formed?
- How are fossils used as indicators of geologic history?

Unit-End Learning Objectives

Students are introduced to the Earth's geological process of change. They explore the mechanism of plate tectonics as it relates to mountain building, earthquakes and volcanism. Students also study rock characteristics, the rock cycle, fossils and geologic time. On completion of this unit, students should be able to do the following.

1] Recognize the layers of the Earth as core, mantle and crust.
2] Understand the theory of plate tectonics.
3] Understand the formation of folds and faults.
4] Understand and explain elastic rebound theory.
5] Understand the use of seismographs and the Richter scale in earthquake detection and measurement.
6] Identify the three types of volcanoes and their differing eruptions.
7] Describe the origin of and locations of volcanoes based on the theory of plate tectonics.
8] Devise a classification scheme for rocks based on observed physical properties.
9] Recognize, understand, and be able to explain what the rock cycle is and how one type of rock can be changed into another type of rock over long periods of time.
10] Describe where and how extrusive and intrusive igneous rocks form.
11] Explain the deposition and lithification of sedimentary rocks.
12] Explain that metamorphic rocks form when the structure and texture of other rocks are changed by exposure to extreme heat and pressure.
13] Understand/identify where metamorphic rocks are likely to form.
14] Explain what intrusions are, where they form, why (including the difference between sills and dikes), and their role in forming metamorphic rock.
15] Describe how fossils are formed in sedimentary rocks.
16] Identify and describe how different fossil types are formed.
17] Understand that the geologic time scale is a relative time scale consisting of four major eras that commence with a major biological change.
18] Recognize, interpret, and be able to create models of the Earth's common physical features in various mapping representations, including contour maps.

Unit 7 – Toward The Stars

Core Topics/Questions/Concepts/Skills

- How do the Earth, Moon and Sun's position cause eclipses, tides, and phases of the Moon?
- How can objects in space be differentiated based on their physical characteristics?
- How does the Earth compare to other objects in space?
- What causes the seasons?

Unit-End Learning Objectives

In this unit, students examine the structure of the solar system. They will seek the explanation for astronomical events and investigate the dynamics of the Sun-Earth-Moon system. Upon completion of this unit, students should be able to do the following.

1] Identify the names and order of the planets in our solar system.
2] Identify the asteroid belt.
3] Differentiate between inner and outer planets.
4] Consider the classification of objects in the solar system.
5] Differentiate between comets, meteoroids, and asteroids.
6] Using a table of statistics, make comparisons of real or imaginary planets and make inferences about how they compare.
7] Identify the common types of galaxies and identify the spiral shape of the Milky Way.
8] Locate the Sun and solar system in an outer arm of the Milky Way spiral galaxy.
9] Understand the theory of the origin of the universe as the Big Bang theory.
10] Recognize the series of steps a main sequence star goes through in its life cycle.
11] Understand the difference between rotation and revolution and the period of time each is equal to.
12] Identify the eight major moon phases and the Sun-Moon-Earth arrangements that cause them.
13] Recognize the Sun-Moon-Earth arrangements that yield solar and lunar eclipses and spring and neap tides.
14] Understand that there are four tides per 24-hour period, as well as four special monthly tides.
15] Understand that the causes of the changing seasons are the tilt of the Earth's axis and the revolution of the Earth around the Sun.
16] Recognize the dates and positions of the Earth and Sun at the equinoxes and solstices.
17] Identify the major theories as to the Moon's formation.

Assessment

Quizzes, Tests, Projects

Materials and Resources

Text

SciencePlus Technology and Society (Level Red). Holt, Rinehart and Winston, 2002. (For Units 0 – 6)

Science Explorer-Astronomy. Pearson Prentice Hall, 2005. (For Astronomy Unit)

Science Explorer-Inside the Earth. Pearson Prentice Hall, 2005. (For Geology only)

Science Explorer-The Nature of Science and Technology. Pearson Prentice Hall, 2005. (For Scientific Method/Skills of Inquiry Unit)