Hingham Middle School
Science Department
Overview

Guiding Principles

Science instruction at Hingham Middle School is guided by the following principles.

1. Science Inquiry. Students will be engaged in the scientific process through hands-on experiments and activities, with an emphasis on the scientific method. Students will learn to form a hypothesis, design an experiment, separate and control variables and interpret data.

2. Lab Technique. Students will develop proper laboratory technique while conducting experiments, and will learn to use lab equipment in a safe and appropriate manner.

3. Critical Thinking. Students will be challenged to think critically as they observe, infer, compare and contrast, recognize cause and effect, and form operational definitions.

4. Organizing Information. Students will organize and communicate science concepts through classifying, sequencing, concept mapping, making and using tables, making and using graphs, and making and using models.

5. Representing and Applying Data. Students will apply quantitative skills as they make measurements in SI units, generate and interpret data, and interpret scientific graphs and illustrations.

Our middle school science program is designed to promote an enthusiasm for science and develop science literacy. The middle school sequence lays the foundation for success in our rigorous high school science program.

The standards-based curriculum is aligned with the Massachusetts Gr. 6-8 science frameworks and vertical articulation ensures a consistent continuum of skills and concepts from one course to the next.

Hingham Middle School
Curriculum Summary

Grade 6 Science
(Heterogeneous Grouping)

DESCRIPTIVE OVERVIEW

The Grade 6 science curriculum features an integrated approach to physical and earth science topics and emphasizes hands-on science inquiry. In the Forces and Motion unit, students will explore fundamental physics concepts, with a special focus on Newton's Laws of Motion. In Properties of Matter, students will develop an understanding of the Periodic Table of Elements, with a focus on atomic structure and the physical properties of elements and compounds. In the Physical Oceanography unit, students will explore tides, waves and currents and analyze the chemical properties of seawater.

GOALS AND OBJECTIVES

The student who successfully completes this course will be able to:

1) Recognize forces, including gravity, inertia and friction, that can cause an object to move, change speed, change direction, or stop moving.
2) Explain the relationship between motion, speed, velocity, and acceleration.
3) Observe Newton's Laws of Motion; predict and calculate the effects of a force on an object.
4) Construct an atomic model, identifying protons, neutrons, and electrons.
5) Use a Periodic Table to classify and describe the properties of major elements.
6) Explain the relationship between atoms, elements, molecules and compounds and distinguish between ionic and covalent bonds.
7) Explain and model global ocean processes such the water cycle, tides, waves, and currents.
8) Explore the composition and properties of seawater.

INSTRUCTIONAL MODEL

In this course, students are engaged in science discovery through a variety of hands-on activities, demonstrations, and experiments. The use of science kits from the Delta Science program promotes a constructivist approach and makes student inquiry central to the instructional model for this course. The application of models and manipulatives and integration of technology provide multiple modes for visualizing science processes.

Reading assignments, lectures, and class discussion reinforce hands-on experiences and deepen student understanding.

EXPECTATIONS AND ASSESSMENT

Students will be evaluated in many ways, including:

- Laboratory reports
- Projects (short and long-term)
- Class presentations
- Homework assignments
- Tests and quizzes

TEXT/RESOURCES

Delta Science Kits, Matter and Change, Delta Science Education, Nashua, NH, 2006.

Delta Science Kits, Newton's Toy Box, Delta Science Education, Nashua, NH, 2011.

Delta Science Kits, Oceans, Delta Science Education, Nashua, NH, 2006.

Berstein, Leonard, et al, Concepts and Challenges in Physical Science, Globe Fearon/Pearson, Upper Saddle River, NJ, 1997.

Hingham Middle School
Curriculum Summary

Life Science (Grade 7; Levels 2, 3 & 4)
Course 502M, 503M, 504M

DESCRIPTIVE OVERVIEW

In this course, fundamental biology concepts are developed using a constructivist approach. From cells and DNA to the functioning organism, details concerning structures and processes are related to the unifying principles and features of all life. With an introduction to theories of the origin of life and the system of scientific classification, students will develop an appreciation of the diversity of living things. The principles of ecology are introduced with an emphasis on adaptations and the interrelated nature of our environment.

GOALS AND OBJECTIVES

The student who successfully completes this course will be able to:

1) Safely and effectively conduct science experiments; demonstrate proper use of lab equipment including microscopes.
2) Explain the parts and function of the cell; compare and contrast plant and animal cells.
3) Model the structure of DNA and explain how genes provide a "blueprint" for genetic traits.
4) Appreciate the biodiversity of the living world and use taxonomy to classify organisms.
5) Explain theories of the origin of life and processes of evolution.
6) Explore biotic and abiotic factors in the environment and understand the interplay of these factors in ecological systems.
7) Identify the structure and function of the major systems of the human body.

INSTRUCTIONAL MODEL

Hands-on activities that promote student inquiry are central to the instructional model for this course. Direct observation of live and prepared specimens provides opportunities for primary experience and individual discovery. Frequent use of models and manipulatives, and the integration of technology, provide visual and tactile experiences.

Reading assignments, lectures, demonstrations and class discussion reinforce hands-on experiences and deepen student understanding.

EXPECTATIONS AND ASSESSMENT

Students will be evaluated in many ways, including:

- Laboratory reports
- Projects (short and long-term)
- Class presentations
- Homework assignments
- Tests and quizzes

TEXT

Daniel, Lucy, et al, Glencoe Life Science, Glencoe/McGraw Hill, Westerville, OH, 1997.

Hingham Middle School
Curriculum Summary

Earth Science (Grade 8; Levels 3 & 4)
Course 523M & 524M

DESCRIPTIVE OVERVIEW

Grade 8 Earth Science is a course designed to provide the student with an awareness, insight, and basic understanding of topics in astronomy, geology, meteorology, and paleontology. An appreciation for a wide variety of natural occurrences is developed through information gathered and the activities completed throughout the year. A strong emphasis is placed on the mapping and modeling of Earth features.

GOALS AND OBJECTIVES

The student who successfully completes this course will be able to:

1) Represent Earth structures through a variety of models, with an emphasis on topographic maps.
2) Explain forces, such as weathering, erosion, and deposition, that continually change Earth's surface.
3) Understand the role of plate tectonics in forming continents and sea floor.
4) Analyze fossil evidence and interpret clues to Earth's past.
5) Describe the dynamics of earthquakes and volcanoes and their impact on Earth's structure.
6) Explain the atmospheric conditions and energy transfers that contribute to Earth's weather.
7) Explore the structure and scale of the universe, from distant stars and galaxies to the dynamics of our own solar system.

INSTRUCTIONAL MODEL

The material is presented in such a way that all modalities of learning are involved:

A. Hand-on activities that promote a constructivist approach.
B. Frequent use and integration of technology.
C. Emphasis on decision making and problem solving in context of current events.
D. Application of science process skills.
E. Thematic organization of content.

EXPECTATIONS AND ASSESSMENT

Students will be evaluated in many ways, including:

- Laboratory reports
- Research projects
- Class presentations
- Homework assignments
- Tests and quizzes
- Observations about the Earth

TEXT

Feather, Ralph, et al, Glencoe Earth Science. Glencoe/McGraw Hill, Westerville, OH, 1997.

Hingham Middle School
Curriculum Summary

Intro to Physical Science (Grade 8; Level 2)
Course 522M

DESCRIPTIVE OVERVIEW

In this course, fundamental physical science concepts are developed using an experimental, inquiry-based approach. Laboratory work, problem solving skills, and reasoning skills are emphasized. Units on plate tectonics and energy are also included.

A strong mathematics background, good study skills and work habits are essential. Students completing this course successfully will progress through a sequence of advanced level courses in Biology, Chemistry, and Physics.

GOALS AND OBJECTIVES

The student who successfully completes this course will be able to:

1) Recognize and utilize laboratory equipment to perform basic chemistry experiments.
2) Gather lab generated information and data, display and describe findings, and analyze results.
3) Perform calculations using significant figures and scientific notation appropriately.
4) Write lab reports, supporting data by a thesis.
5) Verbally present findings and be able to recognize and articulate mistakes.
6) Explain beginning principles of chemistry pertaining to: characteristic properties of a substance and the nature of mixtures, compounds, and elements.
7) Compare and contrast available U.S energy resources.
8) Demonstrate a working knowledge of plate tectonics and how this process has changed the Earth.

INSTRUCTIONAL MODEL

Students' ability to understand the discoveries of others is facilitated by having hands-on experiences. In this course, the laboratory work is integral to understanding. Some of the laboratory facts or laws do not appear explicitly in the accompanying text. It is assumed that students have discovered, through their laboratory experiences, facts or laws on which subsequent sections of the text are based.

The laboratory instructions in the textbook provide a minimum of directions and, by raising questions, call students' attention to the important points in an experiment. Some of the answers to these questions merely require thought; at other times experimentation is needed. Class discussions, both prior to and at the conclusion of each laboratory, help students to refine their predictions, analyze results, and draw conclusions.

EXPECTATIONS AND EVALUATION

IPS is a hands-on, minds-on course where students develop an understanding of the process of science through a process of sequential lab experiments. Written lab reports and other projects will be central to evaluating student performance. Tests and quizzes will also contribute to the student grade.

RESOURCES AND REFERENCES

Goodman, Billy et al, Environmental Science Energy, Globe Fearon, Paramus, NJ, 1995.

Haber-Schaim, Uri et al, Introduction to Physical Science, 7th edition, Science Curriculum, Inc., Belmont, MA, 2001.