Science Department Guide
Coastal Geology Overview

Course Description: Coastal Geology

This is a one semester course covering the basic fundamentals of geology with special emphasis being given to our own Eastern Massachusetts coastal area. Topics covered include: studies of minerals, formation of Cape Cod by glaciation, weathering erosion, effects on the Scituate area from the great storms of the past century, the Colman hills, changes in the North River, erosion of the cliffs, effects of wind and water on our shores, ground water supplies, and the various types of land forms. Also included will be the modern theories about the formation of the universe, sea flooring, plate tectonics, and continental drift. A study of the organisms found in the coastal areas will be given special attention. Their importance to local communities and their future will be explored. Community specialists will be enlisted when possible. Evaluation of the student will be determined by tests, quizzes, laboratory reports, special notes on guest speakers, and class participation

Prerequisite: Grade 11 and 12

Major Course Objectives

When students have completed Coastal Geology, they will know and be able to:

1. Apply the scientific method to solve problems
2. Explain the four major changes that have occurred in the universe
    a. temperature
    b. density
    c. formation of matter and energy
    d. forces
3. Explain the formation of galaxies
    a. types of stars
    b. shapes
    c. size
    d. phases
4. Relate how our solar system was formed
    a. sun
    b. planets and moons
5. Explain the formation of the earth
    a. age of earth
    b. structure of earth
    c. past and present oceans
    d. composition of the earth
    e. geologic time scales
6. Relate plate tectonic theory
    a. crustal plates

    b. plate formation
    c. continental drift
    d. plate movement
7. Describe oceanography
    a. water cycle
    b. physical and chemical weathering
    c. structure of the ocean floor
8. Explain beach formation
    a. structure of beaches
    b. waves
    c. beach conservation
    d. ocean currents
    e. storms

9. Trace the effect of glaciation
    a. Scituate and southeastern Massachusetts
    b. glacial deposits
    c. Cape Cod glaciation
    d. erosion

Relationship to the Massachusetts Science Curriculum Framework

Students engage in

1. Explaining how the transfer of energy through radiation, conduction and convection contributes to the global atmospheric processes.
2. Proving examples of how the unequal heating of the earth and the Coriolis Effect influence global circulation patterns and show their impact on Massachusetts weather and climate.
3. Explaining how the revolution of the earth and the inclination of the axis of the earth cause the earth's seasonal variations (equinoxes and solstices)
4. Describe the various conditions associated frontal boundaries and cyclonic storms (e.g., thunderstorms, winter storms{nor'easters}, hurricanes, and tornadoes) and their impact on human affairs, including storm preparations.
5. Explain the dynamics of ocean currents, including upwelling, density, and deep water currents, the local Labrador Current and the Gulf Stream, and their relationships to global circulation within the marine environment and climate.
6. Describe the effects of longshore currents, storms, and artificial structures (e.g., jetties, sea walls) on coastal erosion in Massachusetts.
7. Explain what causes the tides and describe how they affect the coastal environment.
8. Explain that weather is the most significant source of erosion and how both physical and chemical weathering lead to the formation of sediments and soils, affect the shape of rocks, and create specific landscapes depending on what weathering process is dominant under a specific climate.

9. Describe how glaciers, gravity, wind, temperature changes, waves, and rivers cause weathering and erosion. Give examples of how the effects of these processes can be seen in the local environment.
10. Explain how water flows into and through a watershed, e.g., aquifers, wells, porosity, permeability, water table, capillary water, runoff.
11. Compare and contrast the processes of the hydrologic cycle including evaporation, condensation, precipitation, surface runoff and groundwater percolation, infiltration, and transpiration.
12. Describe the rock cycle and the processes that are responsible for the formation of igneous, sedimentary, and metamorphic rocks. Compare the physical properties of these rock types.
13. Explain how seismic data is used to reveal the interior structure of the layered earth.
14. Trace the development of a lithospheric plate from its growing margin at a divergent boundary (mid-ocean ridge) to its destructive margin at a convergent boundary (subduction zone). Explain the relationship between convection current and the motion of the lithospheric plates.
15. Relate earthquakes, volcanic activity, mountain building and tectonic uplift to plate movements.
16. Explain the Big Bang Theory and discuss the evidence that supports it (backround radiation, and Relativistc Doppler effect-red shit).
17. Explain how the sun, earth, and solar system formed from a nebula of dust and gas in a spiral arm of the Milky Way Galaxy about 4.6 billion years ago.

Assessment Tools
Success in Coastal Geology will be measured by the following methods:

1. Homework may be checked for completeness, accuracy, and/or understanding.
2. Classwork will be evaluated overall by the teacher.
3. Formative and summative quizzes are given as needed.
4. Tests are primarily summative, yet various parts may, as needed, be treated as formative.
5. Unit tests may consist of multiple choice, short answer, and/or open response items.
6. Emphasis is put on organization, notation, accuracy and proficiency of student work.
7. The final exam will consist of primarily multiple choice, short answer and open response questions.
8. Extra credit opportunities will be provided.

Materials and Resources

Feather, Ralph M., Snyder, Susan L., and Hesser, Dale, Merrill Earth Science, New York, Glencoe/McGraw Hill, 1995
Ganeri, Anita, The Oceans Atlas, New York, Dorling Kindersley, 1994

Groves, Don, The Oceans, New York, John Wiley and Sons, Inc., 1989
Parker, Sybil B. Dictionary of Earth Science, New York, McGraw-Hill, 1997
Brown and Morgan, The Miracle Planet, New York, Gallery Books, 1990
Smith, Bruce and McKay, David, Geology Projects For Young Scientists, New York, Franklin Watts, 1992
Videos/Filmstrips/Slides/Rock Kits are in storage closet
Class handouts see Compendia

Relationship to the High School Student Expectations

The members of the Scituate High Science Department will offer to every student the opportunity to:

1. Be an effective reader
2. Be an effective writer
3. Be an effective speaker/presenter/perfomer
4. Be an effective problem solver
5. Be an effective information seeker/organizer
6. Contribute to the community at large