

Freetown Lakeville Public Schools

College Earth Science Unit Guide
Science and Technology Engineering

June 19, 2003

Grade College Earth Science Curriculum Guideline

Purpose of this Curriculum Guide:

Grade College Earth Science Science and Technology Engineering Mission:

Grade College Earth Science Science and Technology Engineering Philosophy:

This curriculum was written by:

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Unit:

Topic:

Student Learning Outcomes

Textbook References, Resources and Materials

- 50401** Identify the sources of internal and external energy of the earth (radioactive decay, gravity, solar energy).
- 50403** Describe the characteristics of waves (wavelength, frequency, velocity, amplitude) with regard to oceans and earthquakes.
- 50405** Explain how the transfer of energy through radiation, conduction, and convection contributes to global atmospheric processes (storms, winds).
- 50406** Explain how the layers of the atmosphere affect the dispersal of incoming radiation through reflection, absorption, and reradiation.
- 50407** Provide examples of how the unequal heating of the earth and the Coriolis Effect influence global circulation patterns and their impact on Massachusetts weather and climate. (convection cells, trade winds, westerlies, polar easterlies, land/sea breezes, mountain/valley breezes).
- 50408** Explain how the revolution of the earth and the inclination of the axis of the earth cause the earth's seasonal variations (equinox and solstices). *
- 50409** Describe how the inclination of the incoming solar radiation can impact the amount of energy received by a given surface area.
- 50410** Describe the various conditions associated with frontal boundaries and cyclonic storms, e.g. thunderstorms, winter storms (nor'easters), hurricanes, tornadoes and their impact on human affairs, including storm preparations.
- 50411** Explain the dynamics of oceanic currents, including upwelling, density and deep water currents, the local Labrador Current and Gulf Stream, and their relationship to the global circulation within the marine environment and climate. *
- 50412** 4Describe the effects of longshore currents, storms and artificial structures (jetties, sea walls) on coastal erosion in Massachusetts.
- 50413** 4Explain what causes the tides and describe how they affect the coastal environment.
- 50414** Explain how scientists study the earth system through the use of a combination of ground-based observations, satellite observations, and computer models of the earth system, and why it is necessary to use all of these tools together.
- 50415** Recognize, describe, and differentiate between renewable and nonrenewable sources of energy.



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- 50416** Explain the advantage and limitations of renewable sources of energy.
- 50417** Explain the advantage and limitations of nonrenewable sources of energy.
- 50418** Describe ways in which people have tried to control the use of renewable and nonrenewable sources of energy (conservation vs. overuse)
- 50419** Describe the effects on the environment of using both renewable and nonrenewable sources of energy.
- 50420** Describe ways in which scientists are addressing these effects on the environment.
- 50421** Explain both physical and chemical weathering and how these processes lead to the formation of sediments, soils, soil texture and structure, and soil horizons.
- 50422** Describe how glaciers, gravity, wind, waves, and rivers cause weathering and erosion. Give examples of how the effects of these processes can be seen in our local environment. *
- 50424** Describe the evolution of the atmosphere.
- 50425** Describe how the oceans store carbon dioxide.
- 50426** Explain how water flows into and through a watershed, e.g. aquifers, wells, porosity, permeability, water table, capillary water, runoff.
- 50427** Compare and contrast the processes of the hydrologic cycle including evaporation, condensation, precipitation, runoff, and infiltration, transpiration.
- 50428** Describe the rock cycle, and the processes which are responsible for the formation of igneous, sedimentary and metamorphic rocks. Compare the physical properties of these rock types.
- 50429** Compare the physical properties and the mineral combinations found in rocks.
- 50430** Explain how the composition and arrangement of atoms determine a mineral's physical and chemical characteristics.
- 50431** Describe the absolute and relative dating methods used to measure geologic time, e.g., index fossils, radioactive dating, law of superposition, and cross-cutting relationships.
- 50433** Explain how seismic data is used to reveal the interior structure of the layered earth.
- 50434** Explain how seismic data is used to locate an earthquake epicenter.
- 50435** Recognize the magnitude values of earthquakes as measured by the Richter scale and give examples of relative damage that would be incurred at each magnitude.

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- 50436** Illustrate the magnetic field of the earth, distinguishing between geographic north and south and magnetic north and south.
- 50438** Explain how paleomagnetic patterns (magnetic reversals), preserved in rocks, provide evidence of the earth's magnetic field over geologic time.
- 50439** 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 currents and the motion of the lithospheric plates.
- 50440** Relate earthquakes, volcanic activity, mountain building and tectonic uplift to plate movements.
- 50441** Relate the effects of sudden seafloor movements to the generation of tsunamis.
- 50442** Provide examples of how societies have been affected by tectonic activity (e.g., hazards from eruptions and earthquakes, bedrock type and soil conditions, building designs)
- 50443** Explain the Big Bang Theory.
- 50444** Explain the unit of distance called a light-year.
- 50450** Explain how the sun, earth, and solar system formed from a nebula cloud of dust and gas in a spiral arm of the Milky Way Galaxy about 4.6 billion years ago.
- 50722** Recognize that matter exists in four phases and explain what happens during a phase change (convection, conduction, radiation).

Suggested Instructional Strategies

Assessment

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Recommended Resources for Grade College Earth Science Science and Technology Engineering: