Nashoba Regional School District

SCIENCE AND TECHNOLOGY/ ENGINEERING

Standards and Benchmarks
Grade 6
Earth and Space Science

Nashoba Regional School District Science and Technology/Engineering Standards and Benchmarks, 2006.

Work in this document is based upon the standards outlined in the Massachusetts Science and Technology/Engineering Curriculum Framework (2006).

SCIENCE AND TECHNOLOGY/ENGINEERING

Acknowledgements

The Science and Technology/Engineering Standards and Benchmarks documents are the result of the work of the 6-8th grade Science Task Force and all of the middle school teachers from within the Nashoba Regional School District. These dedicated teachers spent over a year researching, writing, and editing curriculum that mapped to state mandated standards. The district recognizes the ongoing support of building and district administrators, along with the excellent work of the Science Task Force and district grade-level teachers.

Overview

The Massachusetts Science and Technology/Engineering Curriculum Framework was used as the guide for developing the NRSD Standards and Benchmarks document. "Mastery" expectations have been identified for each grade level in accordance with these documents. Mastery expectations should be based on grade-appropriate developmental performance levels.

Although each grade has unique curriculum – 6th grade focuses on Earth and Space Science, 7th grade focuses on Life Science, and 8th grade focuses on Physical Sciences. In addition, some learning standards are also shared within these grades. Each unit/topic theme includes the appropriate Learning Standards, Big Ideas, and Essential Questions. Additionally, further ideas and resources are included to help guide the teaching of the given unit topic/theme. These resources include: Suggested Coverage Timelines, Student Outcomes, Teaching Strategies and Materials, and Student Assessments. It is our expectation that the "resources" will continue to improve and develop over time.

Science and Technology/Engineering by Grade Level
Grade: 6 - Earth and Space Science
Standards and Benchmarks

PHYSICAL SCIENCES STRAND

Grade 6 students will be **INTRODUCED** to the following learning standards:

Learning Standard PS 1
Differentiate between weight and mass, recognizing that weight is the amount of gravitational pull on an object.

Learning Standard PS 2
Differentiate between volume and mass. Define density.

Learning Standard PS 3
Recognize that the measurement of volume and mass requires understanding of the sensitivity of measurement tools, (e.g., rulers, graduated cylinders, balances) and knowledge and appropriate use of significant digits.

Learning Standard PS 6
Differentiate between an atom (the smallest unit of an element that maintains the characteristics of that element) and a molecule (the smallest unit of a compound that maintains the characteristics of that compound).

Learning Standard PS 7
Give basic examples of elements and compounds.

Learning Standard PS 9
Recognize that a substance (element or compound) has a melting point and a boiling point, both of which are independent of the amount of the sample.

Learning Standard PS 14
Recognize that heat is a form of energy and that temperature change results from adding or taking away heat from a system.

Learning Standard PS 15
Explain the effect of heat on particle motion through a description of what happens to particles during a change in phase.

Learning Standard PS 16
Give examples of how heat moves in predictable ways, moving from warmer objects to cooler ones until they reach equilibrium.

UNIT: Matter

Big Idea:
Everything in the universe is made of matter.

Essential Questions:
Are all things in the universe matter?
What isn't made of matter?
Is energy matter?

UNIT: Matter – continued…

Coverage Timeline

- It is recommended that you plan for 6-8 weeks of instruction, but allow for flexibility based upon resources, student interest, and corresponding opportunities.

Outcomes, Learning Experiences and Assessments

Student Outcomes	Teaching Strategies / Materials	Student Assessment	Standards
Introduction to Matter • Understand the characteristic properties of the three states of matter (boiling point, melting point, and density). • Know differences between elements, compounds, and mixtures. • Know the difference between weight and mass.	• Direct instruction textbook, Ch. 1.Chemical Building Blocks • Lecture PPT/Integrated Technology • Guided Reading –textbook • Laboratory demonstration - water as a compound versus its component elements • Laboratory demonstration - two separate elements and creating a third • Song to listen to: "It's the stuff that dreams are made of" by Carly Simon.	• Quiz • End of unit test	PS 1 (I) PS 6 (I) PS 7 (I) PS 9 (I)

UNIT: Matter – continued…

Student Outcomes	Teaching Strategies / Materials	Student Assessment	Standards
Measuring Matter • Differentiate between mass and volume. • Define density. • Measure matter using laboratory instruments (triple beam balance, graduated cylinders).	• Direct instruction textbook, Ch. 1.Chemical Building Blocks • Lecture PPT/Integrated Technology. • Guided Reading -textbook • Group discussion- weight/mass on moon vs. Earth • Group investigation - Measure mass using triple beam balance/metric system • Group discussion - Archimedes Theory of displacement • Group investigation - measure volume of regular objects vs. irregular objects using displacement • Group investigation - density of salt water vs. fresh; floating properties of objects with different densities • Lab demo • Density property of amber and water • Group investigation - mystery canisters	• Data collection sheets • Investigation write-ups • Quiz • End of unit test	PS 2 (I) PS 3 (I)
Changes in Matter • Understand how a change in state of matter is created (heat, energy). • Recognize the behavior of particles at each state of matter (particle motion). • Know that heat moves from warmer to cooler objects until equilibrium is reached.	• Direct instruction – textbook • Lecture PPT/Integrated Technology • Lab demonstration chocolate or water/ice • Lab demonstration - Aquarium layering effect of different temp colored water • Summary writing - Changes of phase stories, RAFT	• Quiz • End of unit test	PS 14 (I) PS 15 (I) PS 16 (I)

EARTH AND SPACE SCIENCE STRAND

Grade 6 students will demonstrate **MASTERY** of the following learning standards:

Learning Standard ES 3

Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through the Earth's system.

Learning Standard ES 4

Explain the relationship among the energy provided by the Sun, the global patterns of atmospheric movement, and the temperature differences among water, land, and atmosphere.

UNIT: Weather

Big Idea:

The Sun drives the Earth's weather.

Essential Questions:

What causes precipitation?
What other factors influence weather?

Coverage Timeline

- It is recommended that you plan for 6-8 weeks of instruction, but allow for flexibility based upon resources, student interest, and corresponding opportunities.

Outcomes, Learning Experiences and Assessments

Student Outcomes	Teaching Strategies / Materials	Student Assessment	Standards
Energy in the Atmosphere • Comprehend that atmospheric energy is driven by solar. • Understand heat transfer in the atmosphere (radiation, convection, and conduction).	• Direct instruction – textbook • Laboratory demonstration. • Group discussion • Lab demonstration (three methods of heating popcorn) • Integrated Technology (United Streaming Video Clips)	• Visual representations of the three types of heat transfer • Quiz	ES 3 (M)

UNIT: Weather – continued…

Student Outcomes	Teaching Strategies / Materials	Student Assessment	Standards
Global Patterns • Grasp the differences in thermal properties of water, land, and atmosphere. • Recognize the effect of thermal differences on atmospheric and oceanic movement (currents).	• Direct instruction – textbook • Lecture, PPT/Integrated Technology • Group Discussion. • Independent practice – worksheet. • Lab experiment (comparing thermal properties of water, land, and air) • Ongoing group investigation (daily weather journal)	• Journal/weather predictions • Quiz	ES 4 (M)
Climatic Changes • Realize the factors that affect climate. • Understand the difference between global climate and microclimate.	• Direct instruction-textbook • Lecture, PPT/Integrated Technology	• Laboratory report • Quiz • End of unit test	ES 4 (M)

EARTH AND SPACE SCIENCE STRAND – continued…

Grade 6 students will demonstrate **MASTERY** of the following learning standards:

Learning Standard ES 1

Recognize, interpret, and be able to create models of the Earth's common physical features in various mapping representations, including contour maps.

UNIT: Mapping the Earth

Big Idea:

A model of the round Earth looks different than a model of the flat Earth.

Essential Questions:

What does the Earth really look like?
What is the best map for the job?

Coverage Timeline

- It is recommended that you plan for 3-4 weeks of instruction, but allow for flexibility based upon resources, student interest, and corresponding opportunities.

Outcomes, Learning Experiences and Assessments

Student Outcomes	Teaching Strategies / Materials	Student Assessment	Standard
History of Mapping • Observe past and present maps and mapmaking techniques. • Identify Mercator, equal area, Robinson and other map projections.	• Direct instruction-textbook and videos • Group discussion • Demonstration (cut orange, soccer ball, etc.) • Venn diagram (Mercator vs. equal area) • Refer to USGS site on the Internet	• Quiz	ES 1 (M)
Different Types of Mapping • Explain the various physical attributes of maps. • Interpret and use topographic maps (Contour, relief, 3-D).	• Direct instruction-textbook • Integrated Technology / PPT, Video, DVD (Google Earth, NASA, USGS) • Group investigation (Topographic map lab)	• Quiz • Performance assessment. • Interpreting and using a topographic map	ES 1 (M)

EARTH AND SPACE SCIENCE STRAND - continued…

Grade 6 students will demonstrate **MASTERY** of the following learning standards:

Learning Standard ES 2

Describe the layers of the Earth, including the lithosphere, the hot convective mantle, and the dense metallic core.

Learning Standard ES 5

Describe how the movement of the Earth's crustal plates causes both slow changes in the Earth's surface, (e.g., formation of mountains and ocean basins) and rapid ones, (e.g., volcanic eruptions and earthquakes).

Learning Standard ES 6

Describe and give examples of ways in which the Earth's surface is built up and torn down by natural processes, including deposition of sediments, rock formation, erosion, and weathering.

Learning Standard ES 7

Explain and give examples of how physical evidence, such as fossils and surface features of glaciation, supports theories that the Earth has evolved over geologic time.

LIFE SCIENCE STRAND

Grade 6 students will demonstrate **MASTERY** of the following learning standards:

Learning Standard LS 17

Identify ways in which ecosystems have changed throughout geologic time in response to physical conditions. Describe how changes may be catastrophes such as volcanic eruptions or ice storms[1].

UNIT: Earth's Structure

Big Idea:

The Earth is changing beneath your feet and before your eyes on a daily basis.

Essential Questions:

The Earth is solid but is it all the same?
If you could dig a hole through the Earth what would you see?
What causes the Earth to change?
Why do we have eras, epochs and periods?

Coverage Timeline

- It is recommended that you plan for 10-12 weeks of instruction, but allow for flexibility based upon resources, student interest, and corresponding opportunities.

UNIT: Earth's Structure – continued…

Outcomes, Learning Experiences and Assessments

Student Outcomes	Teaching Strategies / Materials	Student Assessment	Standards
Earth's Interior • Describe the four major layers of the Earth (crust, mantle, outer core, inner core) and their importance.	• Group investigation (paper or 3-D models of Earth's interior) • Guided Practice/Graphic organizer by layers and composition; linear, from crust in	• Quiz • Earth's interior - model	ES 2 (M)
Plate Tectonics • Understand that the lithosphere is divided	• Introductory video-plate tectonics, United Streaming	• Quizzes • Tests.	ES 5 (M) LS 17 (M)

[1] Please note that Standard LS 17 has been "unpacked". Changes due to physical or catastrophic conditions are to be addressed at Grade 6; Changes due to interactions among organisms and the actions of humans are to be addressed at Grade 7.

into plates. • Describe how plates move due to the convection currents in the underlying mantle. • Understand that plate movement is an ongoing cycle. • Describe the effects (slow/rapid changes) on Earth's surface due to plate movement. • Describe the effects catastrophic events such as volcanic eruptions can change ecosystems.	• Models (paper, clay, etc.) of plate boundaries • Group investigation (plate movement over time - USGS puzzle, fossil safari, Pangaea puzzle) • The summer of 1816 (Newspaper article circa 1816) from Internet	• Performance assessments • Power Point presentation • Lab report	

UNIT: Earth's Structure – continued…

Student Outcomes	Teaching Strategies / Materials	Student Assessment	Standards
Weathering, Erosion, Deposition • Explain the effects of the chemical and mechanical weathering on rock and land formation. • Understand the process of glaciation. • Describe the erosion and deposition process (wind, water, etc.). • Understand the difference between erosion and weathering.	• Lab demonstration – surface area vs. chemical reactions (Alka-Seltzer whole and crushed vs. water or Tums /Vinegar) • Weathering/Soil Lab • Group investigation deposition/soil lab • Demo: stream table • Guided Practice – flow chart graphic organizer • Water separation to separate soil types	• Quizzes • Tests • Performance Assessments • Power Point Presentation • Lab report	ES 6 (M) ES 7 (M)
Geologic Time Scale • Understand the process of fossilization. • Recognize that eras and periods represent changes in the Earth's surface and climate.	• Geologic time-line (use paper on a roll), time scaled and event cards (humans, dinosaurs, etc.) placed by students working in teams	• Final time-line product • Differentiated assessment: develop a final product that has a component to be plays, timeline, model, rap song , computer games, PowerPoint presentation, board games, short stories; everything must show art work	ES 7 (M) LS 17 (M)

PHYSICAL SCIENCES STRAND

Grade 6 students will be **INTRODUCED** to the following learning standards:

Learning Standard PS 3

Recognize that the measurement of volume and mass requires understanding of the sensitivity of measurement tools, (e.g., rulers, graduated cylinders, balances) and knowledge and appropriate use of significant digits.

UNIT: Scientific Methods and Tools

Big Idea:

Science is a process which is used to learn about our world.

Essential Questions:

Why use the scientific method?
Why doesn't the U.S. use the metric system?
What are the advantages of the metric system?
What constitutes safe laboratory procedures?

Coverage Timeline

- It is recommended that you plan for 2-3 weeks of instruction, but allow for flexibility based upon resources, student interest, and corresponding opportunities.

Outcomes, Learning Experiences and Assessments

Student Outcomes	Activities Investigations	Student Assessment	Resources	Standards
Scientific Method • Introduce "The Scientific Method". • Define terminology. • Design and conduct an investigation using the scientific method (incorporate independent and dependent variables).	• Direct instruction • Textbook • Group discussion • Modeling • Authentic practice	• Pre-assessment • Practice lab design • Performance assessment • Production of a formal lab report	• Internet • SharePoint • United Streaming	

UNIT: Scientific Methods and Tools – continued…

Student Outcomes	Activities Investigations	Student Assessment	Resources	Standards
Metric System • Identify the basic units of the metric system and what they measure.			• Internet • SharePoint • United Streaming • Graduated cylinder • Balance ruler	PS 3 (I)
Lab Technique • Identify and use the appropriate tools to measure volume, mass, temperature, length, etc. • Record and analyze data appropriately (charts, tables, graphs). • Demonstrate safe laboratory practices.			• Internet • SharePoint • United Streaming • Graduated cylinder • Balance ruler	