

Nashoba Regional School District

# SCIENCE AND TECHNOLOGY/ ENGINEERING

Standards and Benchmarks  
Grade 8



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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, 2001 (updated 2006).

**Science and Technology/Engineering by Grade Level**  
**Grade: 8**  
**Standards and Benchmarks**

Massachusetts Curriculum Frameworks (2001) (updated 2006)

**EARTH AND SPACE SCIENCE STRAND**

The following learning standards will be **REINFORCED** for Grade 8 students:

**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.

## **PHYSICAL SCIENCE STRAND**

Grade 8 students will demonstrate **MASTERY** of the following learning standards:

### **Learning Standard PS 11**

Explain and give examples of how the motion of an object can be described by its position, direction of motion, and speed.

### **Learning Standard PS 12**

Graph and interpret distance vs. time graphs for constant speed.

### **Learning Standard PS 13**

Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

### **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: Motion, Force and Energy**

### **Big Idea:**

Force and energy makes the world go round.

### **Essential Questions:**

- Why and how do things move?
- What does motion look like?
- What's hot? What's not?
- How do we get energy from a candy bar?

### **Coverage Timeline**

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

## MOTION, FORCE AND ENERGY UNIT

### Outcomes, Learning Experiences and Assessments

Student Outcomes	Teaching Strategy/Materials	Student Assessment	Resources
<p><b>Motion and Forces</b></p> <ul style="list-style-type: none"> <li>• Interpret motion presented graphically.</li> <li>• Differentiate between, speed, velocity and acceleration.</li> <li>• Articulate Newton’s Laws of Motion.</li> <li>• Explain the relationship between force and motion.</li> </ul> <p><b>Energy</b></p> <ul style="list-style-type: none"> <li>• Differentiate between PE and KE.</li> <li>• Identify and classify as KE and PE the 7 forms of energy.</li> <li>• Recognize that energy can change from one form to another.</li> <li>• Explain the concept of the Conservation of Energy.</li> <li>• Differentiate between heat and temperature.</li> <li>• Recognize the ways in which heat is transferred (conduction, convection, radiation).</li> </ul>	<ul style="list-style-type: none"> <li>• Laboratory investigations</li> <li>• Demonstrations</li> <li>• Model construction</li> <li>• Graph construction and analysis</li> <li>• Integrated technologies</li> <li>• Video</li> <li>• Direct instruction</li> <li>• Mathematical modeling and Practice</li> </ul>	<ul style="list-style-type: none"> <li>• Authentic assessments (catapults &amp; roller coasters)</li> <li>• Tests</li> <li>• Quizzes</li> <li>• Projects</li> <li>• Student presentations</li> <li>• Journals</li> <li>• Lab write ups</li> </ul>	

## **EARTH AND SPACE SCIENCE STRAND**

The following learning standards will be **REINFORCED** for Grade 8 students:

### **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.

### **Learning Standard ES 2**

Describe the layers of the earth, including the lithosphere, the hot convecting 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.

Grade 8 students will demonstrate **MASTERY** of the following learning standards:

### **Learning Standard ES 8**

Recognize that gravity is a force that pulls all things on and near the earth toward the center of the earth. Gravity plays a major role in the formation of the planets, stars, and solar system and in determining their motions.

### **Learning Standard ES 9**

Describe lunar and solar eclipses, the observed moon phases, and tides. Relate them to the relative positions of the earth, moon, and sun.

### **Learning Standard ES 10**

Compare and contrast properties and conditions of objects in the solar system (i.e., sun, planets, and moons) to those on Earth (i.e., gravitational force, distance from the sun, speed, movement, temperature, and atmospheric conditions).

### **Learning Standard ES 11**

Explain how the tilt of the earth and its revolution around the sun result in an uneven heating of the earth, which in turn causes the seasons.

### **Learning Standard ES 12**

Recognize that the universe contains many billions of galaxies, and that each galaxy contains many billions of stars.

## **PHYSICAL SCIENCE STRAND**

Grade 8 students will demonstrate **MASTERY** of 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.

### **Unit: Astronomy**

#### **Big Idea:**

We are only one, insignificant and rather ordinary piece of a puzzle we call the Universe.

#### **Essential Questions:**

How is the Universe formed?

What is out there in the Universe? Are we alone?

Where does the Universe end? Where does it begin?

If we can't live on Earth, where would we live?

Could we live without a sun?

Could we live without the moon?

#### **Coverage Timeline**

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

## ASTRONOMY UNIT

### Outcomes, Learning Experiences and Assessments

Student Outcomes	Teaching Strategy / Materials	Student Assessment	Resources
<p><b>Earth Moon Sun System</b></p> <ul style="list-style-type: none"> <li>• Differentiate between revolution and rotation.</li> <li>• Explain and identify the moon phases.</li> <li>• Explain the reasons for the Seasons.</li> <li>• Explain the cause of eclipses (lunar and solar).</li> </ul>	<ul style="list-style-type: none"> <li>• Journals</li> <li>• Data collection</li> <li>• Modeling</li> <li>• Scientific illustration</li> <li>• Direct instruction</li> <li>• Authentic readings</li> <li>• Technology (United streaming, PPS)</li> <li>• Textbook</li> <li>• Videos</li> </ul>	<ul style="list-style-type: none"> <li>• Quizzes</li> <li>• End of unit test</li> <li>• Informal assessment</li> <li>• Daily journals</li> <li>• Lab write ups</li> <li>• Diagrams and illustration</li> <li>• Expository Writing</li> </ul>	<ul style="list-style-type: none"> <li>ES 1 (R)</li> <li>ES 2 (R)</li> <li>ES 5 (R)</li> <li>ES 6 (R)</li> <li>ES 7 (R)</li> </ul>
<p><b>Celestial Bodies ( stars, meteors)</b></p> <ul style="list-style-type: none"> <li>• Differentiate between meteors, asteroids, stars, planets, moons, comets, nebulae, galaxies.</li> <li>• Explain the function of gravity on celestial bodies.</li> <li>• Compare and contrast celestial bodies (i.e., planets with earth).</li> </ul>			<ul style="list-style-type: none"> <li>ES 8 (M)</li> <li>ES 9 (M)</li> <li>ES 10 (M)</li> <li>ES 11 (M)</li> <li>ES 12 (M)</li> </ul>
<p><b>Universe</b></p> <ul style="list-style-type: none"> <li>• Explain the theory of the Big Bang (origin of the universe).</li> <li>• Articulate a basic concept of scale.</li> </ul>			<ul style="list-style-type: none"> <li>PS 1 (M)</li> </ul>

## **PHYSICAL SCIENCE STRAND**

Grade 8 students will demonstrate **MASTERY** of 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 US 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 six weeks of instruction, but allow for flexibility based upon resources, student interest, and corresponding opportunities.

## SCIENTIFIC METHOD AND TOOLS UNIT

### Outcomes, Learning Experiences and Assessments

Student Outcomes	Teaching Strategy / Materials	Student Assessment	Resources
<p><b>Scientific Method</b></p> <ul style="list-style-type: none"> <li>• Compare and contrast the scientific method to the engineering design process.</li> <li>• Design and conduct an investigation using the scientific method (incorporate independent and dependent variables).</li> </ul>	<ul style="list-style-type: none"> <li>• Direct instruction</li> <li>• Text book</li> <li>• Group discussion</li> <li>• Modeling</li> <li>• Authentic practice</li> </ul>	<ul style="list-style-type: none"> <li>• Performance assessment</li> <li>• Production of a formal lab report</li> </ul>	PS 3 (M)
<p><b>Metric System</b></p> <ul style="list-style-type: none"> <li>• Identify the basic units of the metric system and what they measure.</li> </ul>			
<p><b>Lab Technique</b></p> <ul style="list-style-type: none"> <li>• Identify and use the appropriate tools to measure volume, mass, temperature, length, etc.</li> <li>• Record and analyze data appropriately (charts, tables, graphs).</li> <li>• Demonstrate safe laboratory practices.</li> </ul>			

## **PHYSICAL SCIENCE STRAND**

Grade 8 students will demonstrate **MASTERY** of 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 4**

Explain and give examples of how mass is conserved in a closed system.

### **Learning Standard PS 5**

Recognize that there are more than 100 elements that combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

### **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 8**

Differentiate between mixtures and pure substances.

### **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 10**

Differentiate between physical changes and chemical changes.

### **Learning Standard PS 13**

Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

### **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.

## **Unit: Chemistry**

### **Big Idea**

Atoms are like Lego blocks. Mix and match them to create an infinite and varied world.

### **Essential Questions**

What are the basic building blocks of stuff?

Where does all the variety of stuff come from?

What is the difference between water, ice and steam?

### **Coverage Timeline**

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

## CHEMISTRY UNIT

### Outcomes, Learning Experiences and Assessments

Student Outcomes	Teaching Strategy / Materials	Student Assessment	Resources
<p><b>Properties of Matter</b></p> <ul style="list-style-type: none"> <li>• Identify the characteristic properties which are used to differentiate between substances.</li> <li>• Differentiate between physical and chemical properties.</li> <li>• Differentiate between physical and chemical changes.</li> <li>• Identify and differentiate between the states of matter.</li> <li>• Explain the process involved in changing the states of matter.</li> <li>• Recognize that matter is conserved.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrations</li> <li>• Investigations</li> <li>• Textbook</li> <li>• Model construction</li> <li>• Workbook exercises</li> <li>• Flexible lab groupings</li> <li>• Scaffolding</li> <li>• Jig saw</li> <li>• RAFT</li> <li>• Scientific illustration</li> <li>• Direct instruction</li> <li>• Readings</li> </ul>	<ul style="list-style-type: none"> <li>• Projects</li> <li>• End of unit tests</li> <li>• Quizzes</li> <li>• Journals</li> <li>• Debates</li> <li>• PowerPoint presentations</li> <li>• Performance assessment</li> </ul>	<p>PS 1 (M) PS 2 (M) PS 3 (M) PS 4 (M) PS 5 (M) PS 6 (M) PS 7 (M) PS 8 (M) PS 9 (M)</p>
<p><b>Elements, Compounds and Mixtures</b></p> <ul style="list-style-type: none"> <li>• Differentiate between elements, compounds and mixtures.</li> <li>• Model or diagram the basic atomic structure.</li> <li>• Read and interpret information given on the Periodic Table.</li> <li>• Differentiate between homogeneous and heterogeneous mixtures.</li> <li>• Identify the number and kind of atoms present in a compound when given the chemical formula.</li> </ul>			<p>PS 10 (M) PS 13 (M) PS 14 (M) PS 15 (M)</p>