

Holyoke Public Schools
Middle School Science
Curriculum Map
Grade 8
Unit #4

April 2009

Curriculum Map prepared by

Grade 8 Science Teachers:

Lisa Danguitis, Hugh Edmonds, Cristen Johnson,

&

Dr. Helen L. Gibson, Science Academic Coordinator

November 2007

Resources: Prentice Hall Science Explorer 2005 edition

Student Text: Prentice Hall Science Explorer: *Motion, Forces, and Energy*

Student Edition on Audio CD

- The complete student text is read to students, providing support for students of all learning abilities.

Teacher's Edition

- Detailed planning support, direct instruction methodology, and leveled options for every lesson.

Color Transparencies

- Vibrant transparencies help students visualize key science concepts.

All-in-One Teaching Resources

- Blackline masters, teaching support, and answer keys are organized by chapter, making it easy to find what you need.

TeacherEXPRESS

- (4 CD-ROM Set) contains lesson management software, an Interactive Teacher's Edition, correlates to state and local standards, and instructional tools, plus professional development.

Differentiated Instruction

- Guided Reading and Study Workbook
- Adapted Reading Study Workbook
- Adapted Tests

Discover Channel Videos

- Video segments per chapter engage students by connecting to the real world.

Lab Activity Video & DVDs

- Provides step-by-step lab instruction with middle school students performing labs from every chapter of the text. Promote and teach students proper lab

techniques, inquiry, and safety skills.

Lab and Activity Materials Kits

- Safe and inexpensive materials for every lab activity in the Student Edition.

Massachusetts Science and Technology/Engineering

Learning Standards Grades 6 to 8

Physical Sciences

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

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

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

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

Earth Science

3. Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred.

8. Recognize that gravity is a force that pulls all things on and near the earth toward the center of the earth.

Middle School Science Performance Descriptions Grades 6-8

The student demonstrates conceptual understanding by using a concept accurately to explain observations and make predictions and by representing the concept in multiple ways (through words, diagrams, graphs or charts, as appropriate). Both aspects of understanding -- explaining and representing-- are required to meet this standard.

S1 Physical Science Concepts

S1c Transfer of energy, such as transformation of energy as heat; light,

mechanical motion, and sound; and the nature of a chemical reaction

S5 Scientific Thinking

S5b Uses concepts from Science Standards 1 to 4 to explain a variety of observations and phenomena.

S5f Works individually and in teams to collect and share information and ideas.

S6 Scientific Tools and Technologies

S6d Acquires information from multiple sources, such as print, the Internet, computer data bases, and experimentation.

S7 Scientific Communication

S7a Represents data and results in multiple ways, such as numbers, tables, and graphs; drawings, diagrams, and artwork; and technical and creative writing.

S7d Explains a scientific concept or procedure to other students.

S8 Scientific Investigation

S8a Controlled Experiment

Conducting Simple Investigations About Heat Transfer

Grade 8 Unit #2

Prentice Hall Science Explorer: *Motion, Forces, and Energy*

Chapter 5, Energy, Sec 1: What is Energy?

Work Products (Artifacts)

Vocabulary: energy, kinetic energy, potential energy, gravitational potential energy, elastic potential energy

Journal Entries:

- Have you ever ridden a roller coaster? If yes, please describe your experience as the roller coaster rushed downhill, climbed up a hill, and went around corners. (*elicit prior knowledge*)
- How are energy, work, and power related?
- What are the two basic kinds of energy?
- Describe the conversions between potential and kinetic energy in a roller coaster.
- At what points does a pendulum have the most/least kinetic/potential energy?

In Class Activities:

- Students watch Discovery Channel Video to introduce them to the concept of energy, page 145. Students answer the question: How is gravitational potential energy transformed into electrical energy in a hydroelectric plant?
- Students compare and contrast simple machines and compound machines (introduce students to Rube Goldberg machines).
- Design and build a roller coaster, page 145. Students build a roller coaster to gain hands-on experience with conversion of potential energy into kinetic energy. Scoring rubric is on page 300 in the All-in-One Teaching Resources.

Student Notes:

- Students *work in small groups* to complete the Guided Reading and Study

worksheet, page 303-304 in the All-in-One Teaching Resources.

Online Activity:

- Students observe Rube Goldberg website, and then write a brief summary about what they have learned in their notebooks.

Prentice Hall Science Explorer: *Motion, Forces, and Energy*

Chapter 5: Energy, Sec 2: Forms of Energy

Work Products (Artifacts)

Vocabulary: mechanical energy, thermal energy, electrical energy, chemical energy, nuclear energy, electromagnetic energy

Journal Entries:

- List 3 to 5 everyday examples of various forms of energy. Hint look around the classroom for examples. (*elicit prior knowledge*)
- How can you determine an objects mechanical energy?
- What are some forms of energy associated with the particles that make up objects?
- Students look at figure 6, page 153, Thermal Energy and answer the question: Will the thermal energy of the lava increase or decrease as it flows away from the volcano? Give example of other situations where thermal energy is gained or lost.

In Class Activities:

- Students *work in small groups* to complete the Discover Activity: What makes a flashlight shine? page 151 text. Students answer the Think It Over questions in their notebooks.
- Students *work in small groups* to complete: Calculating Mechanical Energy activity, page 153 text. Students interpret a graph to determine the relationship between height and kinetic energy. Students answer questions 1 to 3 in their notebooks.

Student Notes:

- Students *work in small groups* to complete the Guided Reading and Study

worksheet, page 309-310, in All-in-One Teaching Resources.

- Students *work in small groups* to complete a concept map about Energy, page 171 text.

Prentice Hall Science Explorer: *Motion, Forces and Energy*

Chapter 5: Energy, Sec 3: Energy Transformations and Conservation

Work Products (Artifacts)

Vocabulary: energy transformation, law of conservation of energy, matter

Journal Entries:

- What happens when you rub your hands together? When you're cold, what are some other ways you can get warm? (*elicit prior knowledge*)
- How are different forms of energy related?
- What is a common energy transformation?
- What is the law of conservation of energy?

In Class Activities:

- Students watch the Discover Channel Video on Energy then discuss and answer the question: What is the difference between potential and kinetic energy?
- Students *work in small groups* to complete the Pendulum Swing activity, page 162 text. Students answer the Observing questions.
- Students watch a demonstration about straightening a wire hanger to observe how the temperature of the wire changes after the wire is bent back and forth several times, page 163 text. In their notebooks, students write an explanation about how energy transformations can produce a change in temperature.

Student Notes:

- Students *work in small groups* to complete the Guided Reading and Study worksheet (*graphic organizer*), page 318-320 in the All-in-One Teaching Resources.

Prentice Hall Science Explorer: *Motion, Forces, and Energy*

Chapter 6: Thermal Energy and Heat, Sec 1: Temperature, Thermal Energy, and Heat

Work Products (Artifacts)

Vocabulary: temperature, Fahrenheit scale, Celsius scale, Kelvin scale, absolute zero, heat, specific heat

Journal Entries:

- Describe the hottest and coldest temperatures you have ever experienced? (*elicit prior knowledge*)
- Which drink (hot cocoa or cold chocolate milk) has particles with greater kinetic energy? See figure 1 page 177 text.
- What are the three common temperature scales?
- How is thermal energy related to temperature and heat?
- What does having a high specific heat mean?

In Class Activities:

- Students watch the Discovery Channel Video on Thermal Energy and Heat. Students discuss and write out the answer to the question: How do most materials, including steel, respond to exposure to hot and cold temperatures?
- Students complete the Discover Activity: How cold is the water? Page 176 text. Students answer the Think It Over questions in their notebooks.
- Students fill in a chart (designed by the teacher) about temperature, this could include room temperature, boiling point of water, freezing point of water, etc.
- Students complete Activity Four: How quickly does hot water cool with a cold water coolant? Page 45-46 in the Ice Cream Making and Cake Baking unit by Bernie Zubrowski. This activity helps students develop an understanding of conduction and convection. Students record temperature readings every 30 seconds until the temp of the two liquids remains the same for 3 to 4 readings. Students plot the data on a line graph.

Student Notes:

- Students *work in small groups* to complete the Guided Reading in Study worksheet (*graphic organizer*) page 367-369 in the All-in-One Teaching Resources.

Prentice Hall Science Explorer: *Motion, Forces, and Heat*

Chapter 6: Thermal Energy and Heat, Sec 2: The Transfer of Heat

Work Products (Artifacts)

Vocabulary: conduction, convection, convection current, radiation, conductor, insulator

Journal Entries:

- How would you safely remove a tray of hot cookies from the oven? Explain why. (*elicit prior knowledge*)
- What are the three forms of heat transfer?
- In what direction does heat move?
- How are conductors and insulators different?

In Class Activities:

- Students observe a demonstration of the Discover Activity: What does it take to heat up? Page 183 text. Students answer the Think It Over questions.
- Have students draw a pot of water being heated on a stove and label the convection currents and the path of heat conduction, page 185 teacher's edition.
- Students *work in small groups* to complete Activity Five: Cooling hot water with ice, from Bernie Zubrowski's unit: Ice Cream Making and Cake Baking. Students observe that the hot water never forms ice, and they observe that the ice water doesn't change temperature. Students conduct activities, record observations, and graph their data.

Student Notes:

- Students *work in small groups* to complete the Guided Reading and Study worksheet (*graphic organizer*), page 376-378 in the All-in-One Teaching Resources.

Prentice Hall Science Explorer: *Motion, Forces, and Energy*

Chapter 6: Thermal Energy and Heat, Sec 3: Thermal Energy and States of Matter

Work Products (Artifacts)

Vocabulary: state, change of state, melting, freezing, evaporation, condensation, thermal expansion

Journal Entries:

- Water sometimes exists as ice, a liquid or steam. Explain what causes water to be in one state of matter or another. (*elicit prior knowledge*)
- What are the five states of matter?
- Have you ever heard of a fourth state of matter called plasma? Do you have an idea what it is? If so, explain.
- What causes matter to change state?
- What happens to a substance as its thermal energy increases?

In Class Activities:

- Students *work in small groups* to complete Activity Six: Cooling hot water with ice and salt, from Bernie Zubrowski's unit: Ice Cream Making and Cake Baking. Students observe the temperature of the hot water dropping quickly. They may observe ice forming. Students conduct activities, record observations, and graph their data.
- Students make a graph that shows how the temperature changes as the amount of thermal heat changes, *Changes of State*, see page 192 text.

Student Notes:

- Students *work in small groups* to complete the Guided Reading and Study worksheet (*graphic organizer*) page 386-389 in the All-in-One Teaching Resources.

On Line Activity:

- Students investigate How Plasma televisions work and write a brief description in their notebooks.

<http://electronics.howstuffworks.com/plasma-display.htm>

- Students go on line to learn about the five states of matter, and they take notes in their notebooks about what they learn.

http://www.chem4kids.com/files/matter_states.html