EIGHTH GRADE SCIENCE

CURRICULUM MAP

Amherst Regional Middle School

SCHOOL WIDE ESSENTIAL QUESTIONS:

Change

OVERARCHING ENDURING UNDERSTANDING FOR Science:

The natural world is composed of matter and energy. Understanding how matter and energy change and stay the same in the natural world allows us to interact with the world responsibly.

Science 8 is an introductory general science course focusing on developing an understanding of how matter and energy change and stay the same in the natural world. Primary goals are to promote enthusiasm for science and respect for the physical world, to develop the ability to make informed decisions based on evidence thus acquiring the ability to interact with the world responsibly.

During our exploration of physical sciences and technology, students will study the following units: Properties of Matter and Chemical Interactions; Experimental Design; Motion, Forces, and Energy; Technology/Engineering Design. Concepts are developed through hands-on, investigative, project based activities. Supporting texts for eighth grade science include Prentice Hall's Motion Forces and Energy and Chemical Building Blocks.

Created on 6/20/2007 10:37:00 AM

Unit Title - Properties of Matter
Particle Motion Theory and Physical Properties

Time Frame: 8-9 weeks

Unit Enduring Understanding: Matter is composed of particles, and has physical properties that can be measured and explained.

Unit Essential Questions:

How and why are quantitative data measured and analyzed in science?
What is the relationship between energy and particle motion?
What are the characteristics of mixtures and pure substances?

ARMS Science 8	Massachusetts Frameworks Standards
▪ Use linear, mass, and volume measuring tools with precision and accuracy. ▪ Estimate linear measurements, and measure distance, mass, volume (both direct and indirect methods), weight, temperature, and use appropriate units ▪ Identify and use SI units and metric prefixes kilo, centi, milli, micro, nano ▪ Convert between English and metric units ▪ Multiply and divide by powers of 10 by moving decimals. ▪ Convert between standard and scientific notation. ▪ Consider significant digits when making calculations so that answers make sense. ▪ Differentiate between weight, mass, volume, and density. ▪ Rank objects by weight, mass, volume and density, calculate density, and use floating and sinking to determine relative density. ▪ Explain the particle motion theory, including solids, liquids and gases, thermal expansion, phase changes, and other characteristic properties of matter. ▪ Describe thermal energy and its relationship to particle motion theory and give examples ▪ of how heat moves from warmer to cooler until equilibrium. ▪ Compare and contrast mixtures and pure substances. ▪ Separate mixtures using physical means such as filtering, distillation, chromatography, and magnetism.	PS 1. Differentiate between weight and mass, recognizing that weight is the amount of gravitational pull on an object. PS 2. Differentiate between volume and mass. Define density. 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. PS 4. Explain and give examples of how mass is conserved in a closed system. PS 8. Differentiate between mixtures and pure substances. 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. PS 10. Differentiate between physical changes and chemical changes. PS 14 Recognize that heat is a form of energy and that temperature change results from adding or taking away heat from a system. PS 15. Explain the effect of heat on particle motion through a description of what happens to particles during a change in phase. PS 16. Give examples of how heat moves in predictable ways, moving from warmer objects to cooler ones until they reach equilibrium. (All MSF)

Summative Assessments:
Activities leading to assessments: Distance: IV DV: Toy cars: pull back cars Estimations: length and volumes, Metric Olympics, Controlling Variables Fortune fish: Fish Mass vs. Weight with spring scales Volumes of solids: boxes, wood blocks Volumes of liquids: measuring volume: graduated cylinders Measuring volumes by displacements: Displacement cans, ORQ of displacement Film canister Density Density of metals, coins, Density of liquids, density columns Buoyancy: Archimedes principle, Boats: Cement boats Thermal Expansion: Ball and stick. Liquid Nitrogen, Ice cream Floating sinking liquids heating Phase change lab: balloon in bottle

Unit Title – Properties of Matter **Time Frame: 8-9 weeks**
Particle Structure and Interactions

Unit Enduring Understanding: Matter is composed of particles which combine in predictable ways.

Unit Essential Questions:

How can we use particle characteristics to classify them and infer their structure?
How can we distinguish between physical and chemical changes?
How and why can the Law of Conservation of Mass be modeled and explained?

ARMS Science 8	Massachusetts Frameworks Standards
▪ Describe the structure of atoms and molecules. ▪ Use formulas and equations to explain substances and chemical reactions ▪ Understand how the periodic table is organized ▪ Identify physical and chemical properties of elements and compounds ▪ Use symbols, diagrams and models to show the difference between elements, compounds, and chemical reactions. ▪ Understand that elements cannot be broken down but can be combined to produce compounds. ▪ Differentiate between physical and chemical changes, using models and real substances ▪ Explain examples of conservation of mass during physical changes and chemical reactions.	PS 4. Explain and give examples of how mass is conserved in a closed system. 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. 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). PS 7. Give basic examples of elements and compounds. Knows that many elements can be grouped according to similar properties (e.g., highly reactive metals, less reactive metals, highly reactive non-metals, almost completely non-reactive gases) (McREL) Knows that substances react chemically, in characteristic ways, with other substances to form new substances (compounds) with different characteristic properties. (McREL)

Summative Assessments:

Activities leading to assessments:

Atoms Earring: Michaels'
Kinesthetic Atoms
Properties metals and non-metals
White powder lab: melting points
Element project: pamphlet, infomercial, ppt
Chemical reactions: Sodium, CaCl in bag with phenol read, Soap, disco inferno lab, magnesium burning, Sulfuric acid and sugar conservation of energy, Rust in bottles
Mixtures: lip balm
Hydrogen generator: Hoffman apparatus

Unit Title: Motion, Forces and Energy Time Frame: 6-8 weeks

Unit Enduring Understanding: The interrelation of motion, force, and energy can be described, measured and explained.

Unit Essential Questions:

How can measured data and graphing be used to describe and explain motion?
How can measured data and graphing be used to describe and explain forces?
How can the interrelationship between force and motion be explained?

ARMS Science 8	Massachusetts Frameworks Standards
▪ Describe and demonstrate motion of an object using position, direction and speed. ▪ Graph and interpret distance versus time graphs ▪ Recognize that a force is a push or a pull and that unbalanced forces cause a change in motion. ▪ Understand that force, motion and mass are related (Newton's laws of motion) ▪ Identify types of energy and changes in energy (kinetic and potential, chemical, mechanical and electromagnetic). ▪ Describe how energy is conserved.	PS 11.Explain and give examples of how the motion of an object can be described by its position, direction of motion, and speed. (MSF) PS 12. Graph and interpret distance vs. time graphs for constant speed. (MSF) PS 13 Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa. (MSF) Understands effects of balanced and unbalanced forces on an object's motion (e.g., if more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude; unbalanced forces such as friction will cause changes in the speed or direction of an object's motion.) (McREL) Knows that energy is a property of substances. (McREL) Understand the law of conservation of energy (i.e., energy cannot be created or destroyed but only changed from on form to another. (McREL)
Summative Assessments:	
Activities leading to assessments: Ramp car Propeller car Solar car	

Unit Title: Technology – Engineering Design Time Frame: 5-6 weeks

Unit Enduring Understanding: Engineering is an applied science which uses materials and structured processes for human benefit.

Unit Essential Questions:

How and why is the Universal Systems Model useful?
What is the process used by engineers to design a product?
How can products and structures be tested?

ARMS Science 8	Massachusetts Frameworks Standards
▪ Show that different materials are used for different applications ▪ Choose appropriate materials for a given application based on properties (such as melting point, hardness, conductivity) ▪ Know and apply steps of the engineering design process: • Problem • Research • Develop solutions • Select the best • Construct a prototype • Test and evaluate • Communicate the solution • Redesign ▪ Recognize and apply the Universal Systems Model (goal, input, process, output, feedback) to a variety of systems. ▪ Be able to build or use a system with the universal system model elements. ▪ Demonstrate knowledge of components of structures, structure types and forces that act upon them through structure-building and testing activities. ▪ Identify and explain various subsystems that are parts of vehicles (propulsion, guidance, control).	2. **Engineering design** is an iterative process involving modeling and optimizing for developing technological solutions to problems within given constraints. (MSF) 2.1 Identify and explain the steps of the engineering design process, i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign. 2.3 Describe and explain the purpose of a given prototype. 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype. 2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback. 6. **Transportation technologies** 6.3 Identify and describe three subsystems of a transportation vehicle or device, i.e., structural, propulsion, guidance, suspension, control, and support. 6.4 Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device, e.g., cars, boats, airplanes, rockets. (All from MSF)
Summative Assessments:	
Activities leading to assessment: Hot Air Balloon	

Unit Title: Experimental Design Time Frame: 6-7 weeks

Unit Enduring Understanding: Science knowledge is gained using a structured process which generates knowledge about the natural world.

Unit Essential Questions:

How and why is scientific knowledge gained and modified?

ARMS Science 8	Massachusetts Frameworks Standards
▪ Understand, use and evaluate controlled experiment design, including variables, hypotheses, controls, data tables and graphs, written procedures and conclusions. ▪ Formulate a testable hypothesis, and design and construct a controlled experiment. ▪ Select appropriate tools and technology for experiment. ▪ Draw conclusions based on evidence. ▪ Present and explain findings. ▪ Determine appropriate measurements of central tendency (mean, median, mode, and range) ▪ Use data tables and graph to determine the equation of lines. ▪ Understand which kind of data is best represented by line and bar graphs.	**Grades 6-8** • Formulate a testable hypothesis. • Design and conduct an experiment specifying variables to be changed, controlled, and measured. • Select appropriate tools and technology (e.g., calculators, computers, thermometers, meter sticks, balances, graduated cylinders, and microscopes), and make quantitative observations. • Present and explain data and findings using multiple representations, including tables, graphs, mathematical and physical models, and demonstrations. • Draw conclusions based on data or evidence presented in tables or graphs, and make inferences based on patterns or trends in the data. • Communicate procedures and results using appropriate science and technology terminology. • Offer explanations of procedures, and critique and revise them. (All MSF)
Summative Assessments:	
Activities leading to assessments: Various activities related to measurement in the physical change unit	

(MSF) Massachusetts Science and Technology/Engineering Curriculum Frameworks, 2006
(McREL)