EIGHTH GRADE SCIENCE

CURRICULUM MAP

Amherst Regional Middle School

Draft as of 11/28/2011

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.

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Unit Title - Measurement Time Frame: 5 - 7 weeks

Unit Enduring Understanding: Matter has characteristic properties that can be measured and explained.

Unit Essential Questions:

How and why are quantitative data measured and analyzed in science?

ARMS Science 8	State/National 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.	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.

Unit **Vocabulary**

mass	kilo	gram	graduated cylinder
weight	centi	meter	beaker
length	milli	liter	triple beam balance
density	micro		
volume	nano		

Activities leading to assessments:

Triple Beam Balance
Density demos
Distance: IV DV: Toy cars: pull back cars
Estimations: length and volumes, Metric Olympics,
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
Cement Boats
Penny Feather tube
Buoyancy: Archimedes principle, Boats: Cement boats

Unit Title – Physical Change: Particle Motion Theory Time Frame: 5-7 weeks

Unit Enduring Understanding:

Knowing that matter is composed of very small particles that are in constant motion can help accurately describe physical changes in matter.

Unit Essential Questions:

What is the relationship between energy and particle motion?
What are the characteristics of mixtures and pure substances?

ARMS Science 8	State/National Standards
1. Explain the particle motion theory, including solids, liquids and gases, thermal expansion, phase changes, and other characteristic properties of matter. 2. Describe thermal energy and its relationship to particle motion theory and give examples of how heat moves from warmer to cooler until equilibrium. 3. Compare and contrast mixtures and pure substances. 4. Separate mixtures using physical means such as filtering, distillation, chromatography, and magnetism. 5. Explain how heat moves during radiation, convection and conduction. 6. Understand that mass is conserved when matter changes physically.	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. ESS 3. Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through the earth's system.

Unit Vocabulary

Condensation	Mixture	Radiation
Evaporation	Pure Substance	Conduction
Freezing	Conservation of Mass	Convection
Melting		
Sublimation		
Deposition		
Celsius		

Activities leading to assessments:

Separate mixtures using physical means such as filtering, distillation, chromatography, and magnetism.
Thermal Expansion: Ball and stick.
Liquid Nitrogen, Ice cream
Floating sinking liquids heating
Phase change lab: balloon in bottle
Separate: Sand, Salt, Staples, or Sand, salt, iron filings, poppy seeds, and chromatography
Alcohol water mixture
Distillation: Set up a still, Desalination

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Heat energy infra red thermometers, conductors, insulators,
Melting pennies
Work in group to help people. Signature artifact
Make cookies,
Boil water to spin
Star burst Heat on thermal equilibrium.
Mini s'mores: convection, conduction, radiation. Teddy gram, marshmallows
Angel chimes
Heat transfer challenge.
Popcorn; hot plate conduction, hot air is convection, radiation
Atomic Microscope

Unit Title – Chemistry – Atoms and the Periodic Time Frame: 5-7 weeks Table

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	State/National Standards
1) Describe the structure of atoms and molecules. 2) Understand how the periodic table is organized 3) Identify physical and chemical properties of elements and compounds *(? Is this really another way to ask physical and chemical change? Should this be kept at the larger category level of characteristic property?)* 4) Use symbols, diagrams and models to show the difference between elements, and compounds. 5) Understand that elements cannot be broken down but can be combined to produce compounds.	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)
Unit Vocabulary Electron Proton Neutron Atomic mass Valance shell	
Activities leading to assessments: Obstertainers, black box. First 3 rows, valence shells. Atoms Earring: Michaels' Kinesthetic Atoms Molecular models Properties metals and non-metals White powder lab: melting points	

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Element project: pamphlet, infomercial, ppt
Hoffman
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
Soap.
Hydrogen generator: Hoffman apparatus
All about carbon video online resources. Link to global warming

Unit Title – Chemistry – Chemical Change Time Frame: 5-7 weeks

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

Unit Essential Questions:

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	State/National Standards
1) Use formulas and equations to explain substances and chemical reactions 2) Identify physical and chemical properties of elements and compounds *(? Is this really another way to ask physical and chemical change? Should this be kept at the larger category level of characteristic property?)* 3) Use symbols, diagrams and models to show the difference between elements, compounds, and chemical reactions. 4) Differentiate between physical and chemical changes, using models and real substances 5) 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 10. Differentiate between physical changes and chemical changes. (also in physical change unit) Knows that substances react chemically, in characteristic ways, with other substances to form new substances (compounds) with different characteristic properties. (McREL)
Unit Vocabulary	
Activities leading to assessments: Obstertainers, black box. First 3 rows, valence shells. Atoms Earring: Michaels' Kinesthetic Atoms Molecular models Properties metals and non-metals White powder lab: melting points Element project: pamphlet, infomercial, ppt Hoffman 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 Soap. Hydrogen generator: Hoffman apparatus All about carbon video online resources. Link to global warming	

Unit Title: Motion, Forces and Energy **Time Frame: 10-12 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	State/National Standards
1) Describe and demonstrate motion of an object using position, direction and speed. 2) Graph and interpret distance versus time graphs 3) Recognize that a force is a push or a pull and that unbalanced forces cause a change in motion. 4) Understand that force, motion and mass are related (Newton's laws of motion) 5) Identify types of energy and changes in energy (kinetic and potential, chemical, mechanical and electromagnetic). 6) Describe how energy is conserved. 7) Recognize and apply the Universal Systems Model (goal, input, process, output, feedback) to a variety of systems. 8) Be able to build or use a system with the universal system model elements. 9) Demonstrate knowledge of components of structures, structure types and forces that act upon them through structure-building and testing activities. 10) Identify and explain various subsystems that are parts of vehicles (propulsion, guidance, control).	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 one form to another. (McREL) (Technology & Engineering MSF) 2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback. 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.

Unit Vocabulary

Friction
Gravity,
Lift,
Newton's laws: all 3 make cartoon.
Static Force: Compression, Tension, shear, Torsion (Check with Jamie on these)
Potential/ Kinetic Energy
Speed and acceleration roughly do the math on this. F=ma
Extending the time body to start.

Activities leading to assessments:

Frames of reference
Bridges and building static forces building bridge, software,
Rope make a human suspension bridge.
Web activity: interactive forces lab on Teacher domain.
Ramp car
Propeller car Jen's lab
Solar car
Speed lab distance over time on baseball field. Time at each base.
Energy transfer. Food, chemical, motion,

Unit Title: Experimental Design Time Frame: Incorporated in other units

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?
What are the ways of knowing?

ARMS Science 8	State/National Standards
1) Understand, use and evaluate controlled experiment design, including variables, hypotheses, controls, data tables and graphs, written procedures and conclusions. 2) Formulate a testable hypothesis, and design and construct a controlled experiment. 3) Select appropriate tools and technology for experiment. 4) Draw conclusions based on evidence. 5) Present and explain findings. 6) Determine appropriate measurements of central tendency (mean, median, mode, and range) 7) Use data tables and graph to determine the equation of lines. 8) Understand which kind of data is best represented by line and bar graphs. 9) Ways of knowing: trial and error, scientific problem solving, belief systems 10) Be able to safely work in a lab.	**Grades 6-8**(MSF) • 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.
Unit Vocabulary Hypothesis Independent Variable Dependent Variable Controlled variables Constants	