

Planning by Design: The Critical Connection Between Standards and Effective Instruction

(curriculum mapping, unit planning, lesson planning)

This is one of the Center's capacity-building workshops,
designed with focus on standards-based instructional planning.

8th GRADE SCIENCE CURRICULUM MAP



QUARTER 1				
UNIT 1A: LIFE SCIENCE: REPRODUCTION AND HEREDITY				
Cluster 1				
Big Ideas/Enduring Understandings: Living things reproduce to make more organisms like themselves. Cells are the basic units of life. Traits can be passed from generation to generation. Advancements in science are based upon the work of those who came before. Technological advances in science bring both benefits and risks.			Essential Question(s): How are cells basic units of life? How do living things reproduce to make organisms similar to themselves? Why is an understanding of heredity important? How might advances in science and technology affect society? How is the body of scientific work connected over time?	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
S4C2PO2	Basic principles of heredity	<u>Explain</u> the basic principles of heredity using human examples of eye color, widow’s peak, blood type	Heredity/inheritance DNA Cell Nucleus Gene Growth Reproduce Repair Biology Genetics Trait Dominant Recessive Allele Cross Probability Punnett square Heterozygous Homozygous Genotype Phenotype Co-dominant Graphic organizers	Visual Product with a written summary Scoring Guide/Rubric [Students create a visual representation of key concepts learned with a supporting written summary]
S4C2PO1	Cell division Growth & repair	<u>Explain</u> purpose of cell division		
S4C2PO3	Dominant & recessive traits	<u>Distinguish between</u> dominant & recessive traits		
S2C1P01 S2C1P02	<i>Scientific contributions of diverse people/cultures</i> Gregor Mendel Mendelian Genetics Major scientific milestones	<u>Identify</u> contribution of Mendel. <u>Evaluate</u> the effect of Mendelian Genetics.		
S3C2PO4	Technological advances: Radiation treatment Genetic engineering	<u>Compare</u> risks & benefits of technological advances		
(WS1C1P01, WS1C1P05)	Ideas, Graphic organizers	<i>Generate</i> ideas using graphic organizers		

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(RS1C4P01)	Root words and affixes	<i>Determine</i> the meaning of vocabulary using root words and affixes	Root words Headings	
(RS1C6P05)	Graphic organizers	<i>Use</i> graphic organizers in order to clarify the meaning of the text	Table of context Captions	
(RS1C4PO2)	Context clues	<i>Use</i> context to identify the meaning of unfamiliar words	Bold print Italics	
(RS3C1PO5)	Organizational features	<i>Locate</i> specific information by using organizational features	Glossary Indices Key/guide words Topic sentences Concluding sentences End notes Foot notes Bibliographic references	

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QUARTER 1				
UNIT 1B: INQUIRY PROCESS: LIFE SCIENCE				
Cluster 2				
Big Ideas/Enduring Understandings: Science is organized around questions in the pursuit of knowledge. Scientific knowledge develops as a result of carefully controlled investigations. Scientific understanding requires the use of inquiry, observation, investigation, data collection and analysis, and interpretation. Scientists document and communicate their findings in a variety of ways.			Essential Question(s): What is science? To what extent is science “trial and error?” Does accurate prediction mean we understand “how” and “why”? In what ways is science a tool? How is scientific understanding achieved?	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
S1C2PO2	Controlled investigation	<u>Design</u> a controlled investigation to support or reject a hypothesis	Inquiry Hypothesis Inference Scientific notes, sketches, logs Flawed design Inaccurate measurement Computational errors Unethical reporting Variables Positive relationships Negative relationships No relationship Line Graph Double Bar Graph Stem And Leaf Plot Histogram List Journal Folder Notebook	AIMS look alike: Multiple Choice test with answer key [Students read a passage describing an inquiry experiment and answer questions based on the various components of inquiry]
<i>S1C1PO1</i>	<i>Scientific methods, inquiry process, observation, inference, question (scientific)</i>	<i>Make observations to <u>formulate</u> questions</i>		
S1C1PO3	Hypothesis	<u>Generate</u> a hypothesis		
<i>S2C2PO1</i>	<i>Scientific processes</i>	<u>Apply</u> the scientific processes to various situations requiring problem solving or decision making <i>(<u>Observing, Questioning, Communicating, Comparing, Measuring, Classifying, Predicting, Organizing data, Inferring, Generating hypotheses, Identifying variables</u>)</i>		
S1C2PO3	Steps of an investigation	<u>Conduct</u> an investigation to support or reject an hypothesis		
<i>S1C2PO5</i>	<i>Ways of data collection</i>	<u>Record</u> data from investigation using notes, sketches, written logs		

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S1C3PO6	Potential Investigational error: Flawed design Inaccurate measurement Computational errors Unethical reporting	<u>Identify</u> potential errors that may occur (flawed procedures, inaccurate measurements, computational errors, unethical reporting)	Observations Notes Lists Charts Map labels Legends Directions Procedures Rubrics Labels Posters Graphics/tables
S1C3PO3	Relationships between variables: positive, negative or none	<u>Interpret</u> data to show relationships between two variables	
<i>S1C4PO2</i>	<i>Graphic representations of data: line graph, double bar graph, stem and leaf plot, histogram</i>	<u>Design</u> an appropriate graphic representation of the collected data	
S1C4PO1 <i>S1C4PO5</i>	Results and conclusion of an investigation	<u>Communicate</u> the results and conclusions of an investigation	
(S1C6PO1)	Text features	<i>Predict</i> text content using prior knowledge, and text feature (e.g. illustrations, titles, topic sentences, key words)	
(WS1C1PO6)	Record	Maintain a record	
(WS3C2PO1)	Information	<i>Record</i> information	
(WS3C3PO1)	Variety of functions	<i>Write</i> a variety of functional text	
(RS1C6PO7)	Reading strategies	<i>Use</i> reading strategies (e.g. drawing conclusion, determining cause and effect, making inferences, sequencing to interpret text)	
(RS1C6PO3)	Clarifying questions	Generate clarifying questions in order to comprehend text	
(RS3C1PO2)	Main idea with critical details	<i>Summarize</i> the main idea (stated or implied) and critical details of expository text, maintaining chronological, sequential, or logical order	

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QUARTER 1				
UNIT 2A: LIFE SCIENCE: DIVERSITY, ADAPTATION AND BEHAVIOR				
Cluster 3				
Big Ideas/Enduring Understandings: Diversity of life is the result of the ongoing process of evolution and a changing environment. Organisms adapt to the same environment in a variety of ways. Organisms' structures and behaviors adapt to diverse environments. Species change over time. Life forms reflect inherited traits, genetically cultivated traits and acquired skills through the environment. The relationship of organisms within an ecosystem is essential for life.			Essential Question(s): Why are certain structures critical to the survival of a living organism? Why are behavioral adaptations required for an organism's survival? How do organisms adapt to survive in various environments? Why do certain organisms in the same environment have diverse characteristics? Why is diversity and adaptation important for survival? How and why are relationships of organisms established? Why can't we all be predators?	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
S4C4PO6	Structures necessary for survival of living organism	<u>Describe</u> structures necessary for survival of living organisms	Adaptation Ecosystem Symbiotic relationships Pollination Seed dispersal Protective coloration Organism Environment Behavioral cycles Migration Hibernation Estivation Dormancy Competition Predation Symbiosis Mutualism Parasitism	Visual Representation with Scoring Guide/Rubric [Students create a visual representation of concepts assessed. Students write 2-3 sentences describing what they have drawn]
S4C4PO3	Characteristics of organisms that change over generations	<u>Describe</u> characteristics of organisms that change over generations		
S4C4PO1	Organism's behavior that allow survival in an environment	<u>Explain</u> how an organism's behavior allows it to survive in different environments		
S4C4PO5	Behavioral cycles of organisms	<u>Analyze</u> behavioral cycles of organisms		
S4C4PO4	Symbiotic and competitive relationships in organisms within an ecosystem (lichen, mistletoe/tree, clownfish/sea anemone, native/non-native species)	<u>Compare</u> the symbiotic and competitive relationships in organisms within an ecosystem		

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S4C4PO6	Factors (behavioral) that allow living organisms to survive	<u>Describe</u> how an organism can maintain a stable internal environment while living in a changing external environment <Explain how endotherms and ectotherms maintain stable internal environments.> <Compare & contrast diurnal & nocturnal behaviors in organisms>	<Endotherm> <Ectotherm> <Diurnal> <Nocturnal>	
(RS1C1PO9)	Organizational structures (chronological order, comparison and contrast, cause and effect, relationships, logical order, classification schemes)	Apply knowledge of organizational structures (e.g. chronological order, comparison and contrast, cause and effect, relationships, logical order, classification schemes) of expository text to aid comprehension		
(WS2C1PO1)	Ideas and details to support the topic	<i>Use</i> clear, focused ideas and details to support the topic		
(WS2C5PO1)	Simple and compound sentences	<i>Write</i> simple and compound sentences		

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QUARTER 1				
UNIT 2B: INQUIRY PROCESS: LIFE SCIENCE				
Cluster 4				
Big Ideas/Enduring Understandings: Controlled investigations are created to support or reject scientific hypotheses. Scientists extract information from multiple sources and draw logical conclusions. Questions based on observation and further inquiry lead to the development of hypotheses. An understanding of scientific processes aids in problem-solving in other disciplines and in life in general.			Essential Question(s): What is science? To what extent is science “trial and error?” Does accurate prediction mean we understand “how” and “why”? In what ways is science a tool? How is scientific understanding achieved?	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
S1C2PO2 <i>*S1C1PO1</i> <i>*S1C2PO1</i> <i>*S1C1PO3</i> S1C1PO2 S1C3PO7 S2C2PO4	Controlled investigation <i>Questions based on observations</i> <i>Safe behavior</i> <i>Appropriate procedures</i> Testable hypothesis Appropriate research information used to test hypothesis Scientific reports Characteristics of quality scientific claims	<u>Design</u> a controlled investigation to support or reject a hypothesis <i>Formulate</i> questions based on observations that lead to the development of a hypothesis <i>Demonstrate</i> safe behavior and appropriate procedures <u>Generate</u> a hypothesis that can be tested <u>Use</u> appropriate scientific research information from multiple sources to develop a testable hypothesis <u>Critique</u> scientific reports from periodicals, television and other media <u>Explain</u> why scientific claims may be questionable	Scientific method Inquiry process Observation Inference Hypothesis Variable Independent Variable Dependent Variable Testable hypothesis Scientific reports Periodicals Appropriate data Sample size Bias Uncontrolled samples	True-False test over key ideas Answer key

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*S2C2PO1	<i>Scientific processes</i>	<u>Apply scientific processes to other problem solving situations</u> <u>(Observing, Questioning, Communicating, Comparing, Measuring,</u> <u>Classifying, Predicting, Organizing data, Inferring, Generating</u> <u>hypotheses, Identifying variables)</u>		
(RS1C6PO3)	Clarifying questions	Generate clarifying questions in order to comprehend text		

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QUARTER 1				
UNIT 3: HISTORY AND NATURE OF SCIENCE: NATURE OF SCIENTIFIC KNOWLEDGE				
Cluster 5				
Big Ideas/Enduring Understandings: Scientific knowledge changes with new information and technology. New information and technology lead to advancements in science. Society is influenced by scientific advancements. Science offers a multitude of career opportunities.			Essential Question(s): How does scientific knowledge change? How does science influence everyday life? How do scientific career opportunities expand over time? What drives scientific and technological advancement?	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
<i>S2C2PO2</i>	<i>Scientific knowledge</i>	<i>Describe</i> how scientific knowledge changes with new information and/or technology	Genetics Mendelian genetics	Project with Rubrics/Scoring Guides [Students create a brochure on Mendel or Darwin; students given criteria that includes skills assessed in this unit]
* <i>S2C1PO1</i>	<i>Darwin and Mendel</i>	<i>Identify</i> important contributions of Darwin and Mendel		
S2C1PO4	Career opportunities in science	<i>Evaluate</i> career opportunities in life science		
*S2C1PO2	Mendelian Genetics Mendel	<i>Evaluate</i> effects of major scientific milestones on society		
(WS3C6PO1)	Sources of information	<i>Write</i> a summary of information from sources (e.g. research materials) using paraphrasing and main ideas with relevant details		
(WS3C2PO2)	Summary with topic sentences, supporting details, relevant information	<i>Write</i> a summary based on the information gathered that includes: topic sentences, supporting details, relevant information		
(WS1C5PO1)	Formats of writing and presentation	Prepare writing in a format (e.g. oral presentation, manuscript, multimedia) appropriate to audience and purpose		
(WS2C2PO3)	Details to support the main idea	Place details appropriately to support the main idea		
(RS3C1PO6)	Resources	Locate appropriate print and electronic resources for a specific purpose		

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QUARTER 2				
UNIT 4A: PHYSICAL SCIENCE: MOTIONS AND FORCES				
Clusters 6, 7, and 8				
Big Ideas/Enduring Understandings:			Essential Question(s):	
Inertia is everywhere. Forces are acting all around us. Newton's Laws can explain all motion or the lack of motion in the universe. The motion of an object is directly related to force. Net force is dependent upon mass and acceleration. The interdependence of motion, velocity, mass, and force is key to Newton's 3 Laws			How do forces affect the motion of an object? How do objects move? Is it possible for an object to ever be completely at rest? Of what value are Newton's Laws? What is the relationship between force and motion? How are motion, velocity, mass, and force interdependent?	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
S2C2PO2 <i>RS3C1PO1</i> <i>RS3C1PO2</i>	Scientific knowledge <i>Main idea (explicit and implicit) in expository text</i> <i>Summary</i> <i>Critical details</i>	<u>Describe</u> <i>how scientific knowledge changes with new info and/or technology</i> <u>Restate</u> <i>main idea</i> <u>Summarize</u> <i>main idea</i>	Isaac Newton Expository text Summary Explicit/implicit Critical details Velocity Physics Inertia Force Motion Reference point Rate Speed Speed= $\frac{\text{distance}}{\text{time}}$ Acceleration Negative acceleration	Short answer with key [Students answer questions regarding Newton's 3 Laws with application to "real world"]
S5C2PO2 S5C2PO1 S5C2PO5	Newton's 1st Law of Motion State of motion Velocity Rate of change Position-time graphs Velocity-time graphs	<u>Identify</u> conditions under which a body will continue in motion <u>Demonstrate</u> <i>velocity</i> <u>Create</u> <i>a graph</i> <u>Identify</u> <i>variables</i> <u>Predict</u> <i>the outcome of a situation involving the 1st Law</i>		
S1C2PO3 <i>S1C1PO1</i> S1C4PO1 <i>S1C4PO5</i>	Controlled investigation Hypothesis <i>Results and conclusion of an investigation</i>	<u>Conduct</u> a controlled investigation <u>Formulate</u> <i>questions based on observations that lead to a hypothesis</i> <u>Communicate</u> <i>the results and conclusion of the investigation</i>		

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<p>S5C2PO3 S5C2PO1 S5C2PO5</p>	<p>Newton's 2nd Law of Motion Mass Net applied force</p>	<p><u>Describe</u> how the acceleration of a body is dependent on mass and applied force <u>Differentiate</u> among speed, velocity, acceleration <u>Calculate</u> average velocity of an object given the formula for speed <u>Create</u> a graph devised from measurements of moving objects and their interactions <u>Predict</u> what will happen to variables when one increases or decreases ($F=ma$) <u>Identify</u> situations demonstrating 2nd law <u>Predict</u> the outcome of a situation involving 2nd Law</p>	<p>Mass Net force Force pairs Action Reaction Constant acceleration Constant velocity Interactions</p>	
<p>S1C2PO3 <i>S1C1PO1</i> S1C4PO1 <i>S1C4PO5</i></p>	<p>Controlled investigation Hypothesis <i>Results and conclusion of an investigation</i></p>	<p><u>Conduct</u> a controlled investigation <i>Formulate questions based on observations that lead to hypothesis</i> <i>Communicate the results and conclusion of the investigation</i></p>		
<p>S5C2PO4 S5C2PO1 S5C2PO5</p>	<p>Newton's 3rd Law of Motion Forces Interactions between bodies</p>	<p><u>Describe</u> forces as interactions between bodies <u>Identify</u> examples of action-reaction force pairs <u>Identify</u> situations involving 3rd law <u>Predict</u> the outcome of a situation involving 3rd law</p>		
<p>S1C2PO3 <i>S1C1PO1</i> S1C4PO1 <i>S1C4PO5</i></p>	<p>Controlled investigation Hypothesis <i>Results and conclusion of an investigation</i></p>	<p><u>Conduct</u> a controlled investigation <i>Formulate questions based on observations that lead to hypothesis</i> <i>Communicate the results and conclusion of the investigation</i></p>		
<p>(WS2C4PO1)</p>	<p>Words</p>	<p>Use accurate, specific, powerful words that effectively convey the intended message</p>		
<p>(WS3C6PO2)</p>	<p>Informational report including focused topic, appropriate facts and relevant details, logical sequence, a concluding statement, a list of sources used</p>	<p>Write an informational report that includes: focused topic, appropriate facts and relevant details, logical sequence, a concluding statement, a list of sources used</p>		

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QUARTER 2				
UNIT 4B: INQUIRY PROCESS: MOTIONS AND FORCES				
Cluster 9				
Big Ideas/Enduring Understandings: The scientific method deliberately isolates and controls key variables and is not just “trial and error.” Scientific processes involve diverse and complex skills and thinking. Scientists must be concerned with potential investigational errors. Scientific claims must be verified by independent investigations.			Essential Question(s): How might investigational errors influence outcomes? Why should experiments be repeated? How do independent investigations validate scientific claims? Why do scientific claims need to be verified? In what ways are scientific processes both diverse and complex?	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
*S1C2PO2	Controlled investigation Hypothesis	<u>Conducting</u> investigations	Hypothesis Procedures Scientific process Variables Extraneous variables Control group Flawed investigational design Investigational error Computational error Inaccurate measurement Unethical reporting Openness Replication Credibility Positive relationship Negative relationship No relationship Trends Line graph Double bar graph	Critical Review: Analysis of a Lab Scoring Guide/Rubric [Students look at lab and write a critical review with guided prompts]
*S1C1PO1 S1C1PO3	<i>Controlled variable (constant)</i>	<i><u>Formulate</u> questions <u>Make</u> observations <u>Develop/generate</u> a hypothesis</i>		
*S2C2PO1	<i>Scientific processes</i>	<i><u>Apply</u> scientific processes to other problem solving decision making situations <u>(Observing, Questioning, Communicating, Comparing, Measuring, Classifying, Predicting, Organizing data, Inferring, Generating hypotheses, Identifying variables)</u></i>		
*S1C2PO3	Control group Experimental group	<u>Conduct</u> a controlled investigation to support or reject a hypothesis <u>Operate</u> equipment <u>Identify</u> extraneous variables that need to be controlled <u>Identify</u> control and experimental groups <u>Design</u> an experiment to test a hypothesis		
*S1C2PO4	<i>Know appropriate scientific tools (balances, microscopes, micrometers, probes)</i>	<i><u>Perform</u> measurements using appropriate tools</i>		

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*S1C2PO5	<i>Scientific report Observation Record</i>	<u>Record</u> observations, notes, sketches, questions, and ideas using tools (written/computer)	Stem and leaf plot Histogram
*S1C3PO6	Possible investigational errors: Flawed investigational design Computational error, Inaccurate measurement, Unethical reporting)	<u>Identify</u> possible investigational errors	
S2C2PO3	Principle of accurate record keeping, openness and replication	<u>Defend</u> the principle	
*S1C3PO3	Possible relationships between two variables	<u>Interpret</u> data	
S1C3PO4	True investigation	<u>Formulate</u> a true investigation based on data	
S1C3PO1	<i>Trends</i>	<u>Analyze</u> data <u>Identify</u> trends	
*S1C4PO2	<i>Graphic representation Line graph Double bar graph Stem and leaf plot Histogram</i>	<u>Choose</u> appropriate graphic representation	
S1C4PO4	Step by step instructions	<u>Write</u> clear step-by-step instructions for conducting experiments or operating equipment (without personal pronouns) <u>Organize</u> data	
*S1C4PO1 *S1C4PO5	<i>Results and conclusion of an investigation</i>	<u>Communicate</u> the results and conclusion of the investigation	
(WS3C2PO1)	Information (e.g. observations, notes, lists, charts, map labels, and legends	Record information (e.g. observations, notes, lists, charts, map labels, and legends) related to the topic	
(WS3C2PO2)	Summary	Write a summary based on the information gathered	

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QUARTER 2				
UNIT 5A: PROPERTIES AND CHANGES OF PROPERTIES IN MATTER				
Cluster 10				
Big Ideas/Enduring Understandings: Matter has both physical and chemical properties. All objects and substances are made of matter. Matter is characterized by its properties and may undergo changes. The scientific understanding of elements requires a systematic organization and presentation. Chemical reactions produce new substances that have different chemical and physical properties.		Essential Question(s): How and why does matter change? Why can materials with the same composition be so different (e.g., graphite, diamonds)? Why was there a need for a systematic organization of the elements? Why does matter, matter? How and why does matter change? How do matter and energy relate? How are energy transformations applied in today's world?		
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
S5C1PO4	Matter Elements Mixtures Compounds	<u>Classify</u> matter	Matter Elements Mixtures Compounds Periodic Table of Elements	Short answer w/key
S5C1PO6	Systematic organization Periodic Table of Elements	<u>Explain</u> the systematic organization of the Periodic Table	Chemical reaction: (Formulation of a precipitate	
S5C1PO3	Evidence of a chemical reaction: (Formulation of a precipitate, Generation of gas, Unexpected color change, Absorption or release of heat)	<u>Identify</u> types of evidence of a chemical reaction	Generation of gas Unexpected color change Absorption or release of heat	
S5C1PO7	Transfer of energy Physical and chemical properties of matter	<u>Investigate</u> how transfer of energy can affect physical and chemical properties of matter	Transfer of energy) Physical properties of matter Chemical properties of matter	

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S5C1PO1	Different kinds of matter: physical properties	<u>Identify</u> different kinds of matter based on specific physical properties		
S5C1PO2	Different kinds of matter: chemical properties	<u>Identify</u> different kinds of matter based on specific chemical properties		
(WS2C1PO3)	Explanation or exploration of the topic	Develop a sufficient explanation or exploration of the topic		

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QUARTER 2				
UNIT 5B: INQUIRY PROCESS: PROPERTIES AND CHANGES OF PROPERTIES IN MATTER				
Cluster 11				
Big Ideas/Enduring Understandings: The scientific method deliberately isolates and controls key variables and is not just “trial and error.” Scientific processes involve diverse and complex skills and thinking. Scientists must be concerned with potential investigational errors. Scientific claims must be verified by independent investigations.			Essential Question(s): How might investigational errors influence outcomes? Why should experiments be repeated? How do independent investigations validate scientific claims? Why do scientific claims need to be verified? In what ways are scientific processes both diverse and complex?	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
*S1C2PO2	Controlled investigation Hypothesis		Hypothesis Procedures Scientific process Variables Extraneous variables Control group Flawed investigational design Investigational error Computational error Inaccurate measurement Unethical reporting Openness Replication Credibility Positive relationship Negative relationship No relationship Trends Line graph Double bar graph	Written Product: Critical review of a lab [Students examine variables and respond to guided prompts]
*S1C1PO1 S1C1PO3	<i>Controlled variable (constant)</i>			
*S2C2PO1	<i>Scientific processes</i>			
*S1C2PO3	Control group Experimental group			
*S1C2PO4	<i>Know appropriate scientific tools (balances, microscopes, micrometers, probes)</i>			
	Conducting investigations			
	<i>Formulate questions</i> <i>Make observations</i> <i>Develop/generate a hypothesis</i>			
	<i>Apply scientific processes to other problem solving decision making situations</i> <i>(Observing, Questioning, Communicating, Comparing, Measuring, Classifying, Predicting, Organizing data, Inferring, Generating hypotheses, Identifying variables)</i>			
	Conduct a controlled investigation to support or reject a hypothesis Operating equipment Identify extraneous variables that need to be controlled Identify control and experimental groups Design an experiment to test a hypothesis			
	<i>Perform measurements using appropriate tools</i>			

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8th GRADE SCIENCE CURRICULUM MAP

*S1C2PO5	<i>Scientific report Observation Record</i>	<u>Record</u> observations, notes, sketches, questions, and ideas using tools (written/computer)	Stem and leaf plot Histogram
*S1C3PO6	Possible investigational errors: (Flawed investigational design Computational error Inaccurate measurement Unethical reporting)	<u>Identify</u> possible investigational errors	
S2C2PO3	Principle of accurate record keeping, openness and replication	<u>Defend</u> the principle	
*S1C3PO3	Possible relationships between two variables	<u>Interpret</u> data	
S1C3PO4	True investigation	<u>Formulate</u> a true investigation based on data	
S1C3PO1	<i>Trends</i>	<u>Analyze</u> data <u>Identify</u> trends	
*S1C4PO2	<i>Graphic representation Line graph Double bar graph Stem and leaf plot Histogram</i>	<u>Choose</u> appropriate graphic representation	
S1C4PO4	Step by step instructions	<u>Write</u> clear step-by-step instructions for conducting experiments or operating equipment (without personal pronouns) <u>Organize</u> data	
*S1C4PO1 *S1C4PO5	<i>Results and conclusion of an investigation</i>	<u>Communicate</u> the results and conclusion of the investigation	
(WS1C3PO8)	Resources and reference materials	Use resources and reference materials to select more precise vocabulary	
(WS1C2PO2)	Writing to an audience	Organize writing into a logical sequence that is clear to the audience	

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8th GRADE SCIENCE CURRICULUM MAP

QUARTER 3				
UNIT 6A: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES				
Clusters 12 and 13				
Big Ideas/Enduring Understandings: Environmental issues and related risk factors range from local to national to global. Human’s ability to shape and control the environment is related to their capacity for using advanced technologies. Use of technology can be beneficial as well as detrimental to the environment. All solutions to environmental issues must be developed and evaluated based on a risk-benefit analysis. To solve pressing environmental problems, they must first be carefully identified, scientifically investigated, alternative solutions considered, and strategic courses of action developed.		Essential Question(s): How is solving environmental problems similar to solving other societal and personal problems? What is the relationship of technology and the environment? How can the use of advanced technologies be both beneficial and risky? How are environmental problems best resolved? What is the value of a risk-benefit analysis?		
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
S3C1PO1	Risk factors associated with natural, human induced, biological hazards	<u>Analyze</u> the risk factors of: <ul style="list-style-type: none"> • waste disposal of industrial chemical • greenhouse gases 	Greenhouse Gas Radiation Viable Waste Disposal Greenhouse Gas	Persuasive Essay with anchor papers and rubric
*S3C2PO4	Risks and benefits of technological advances	<u>Compare</u> the risks and benefits of: <ul style="list-style-type: none"> • Radiation treatments • Genetic engineering • Airbags 		[Students examine various risk factors related to a topic of their choice, take a position, and develop logical arguments to support their point of view]
<i>S3C2PO1</i>	<i>Viable methods of responding to an identified need or problem</i>	<u>Propose</u> viable solutions to these problems: <ul style="list-style-type: none"> • Waste disposal of industrial chemicals • Greenhouse gases 		
S3C1PO2 *S3C2PO2	Possible solutions addressing environmental risks with chemicals and biological systems	<u>Analyze</u> and <u>compare</u> solutions to best address an identified need or problem <ul style="list-style-type: none"> • Waste disposal of industrial chemicals • Greenhouse gases 		

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8th GRADE SCIENCE CURRICULUM MAP

*S3C2PO3	<i>Possible solution to an identified need or problem using simple classroom materials</i>	<u><i>Design and construct</i></u> possible solutions to an identified problem using simple classroom materials		
(WS1C3PO1 WS1C3PO2 WS1C3PO3 WS1C3PO4 WS1C3PO5 WS1C3PO6 WS1C3PO7)	Clear and effective draft	Revising including evaluating and refining the rough draft for clarity and effectiveness		
(WS3C4PO1)	Persuasive text that includes persuasive techniques and excludes irrelevant information	Write persuasive text that establishes and develops a controlling ideas, supports arguments with detailed evidence, includes persuasive techniques, excludes irrelevant information, attributes sources of information when appropriate		
(RS3C1PO6)	Sources of print and electronic resources	Locate appropriate print and electronic resources		

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8th GRADE SCIENCE CURRICULUM MAP

QUARTER 3					
UNIT 6B: INQUIRY PROCESS: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES					
Cluster 14					
Big Ideas/Enduring Understandings:	A controlled investigation requires logical arguments, analysis and the drawing of conclusions. Recommendations for future investigations and the generation of new questions stimulate further inquiry. The quality of a conclusion is based on the validity and reliability of the supporting evidence.		Essential Question(s):	Of what value is validity and reliability? How does scientists' work parallel what problem-solvers do in other careers? From where does inquiry emanate? What is the genesis of inquiry?	
AZ Standard	Essential Learning			Key Vocabulary	Summative Assessment
	Knowledge	Skills			
*S1C2PO3	A controlled investigation	<u>Conduct</u> a controlled investigation to support or reject a hypothesis		Results Analysis Conclusion Reliability Validity	Written Product with checklist [Students create an exam over specified content. Exam must have questions and answers including reference pages and notes from text.]
*S1C3PO2	<i>Logical argument</i>	<i><u>Form</u> a logical argument about a correlation between variables or sequence of events based on data</i>			
S1C4PO3	Analyses and conclusions	<u>Write</u> analyses matching data, and write conclusions that match the questions			
*S1C4PO1 *S1C4PO5	Results of an investigation	<u>Communicate</u> the results and conclusions of experiments, informally and formally			
*S1C3PO4	Future investigations	<u>Identify</u> possible future investigations based on data collected			
S1C3PO8	New questions	<u>Formulate</u> new questions based on the results of a previous investigation			
*S1C3PO5	Evidence supports the validity and reliability of a conclusion	<u>Explain</u> how evidence supports the validity and reliability of a conclusion			
(WS3C6PO1)	Paraphrasing techniques	Write a summary of information from sources paraphrasing to convey ideas from the source			

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8th GRADE SCIENCE CURRICULUM MAP

(WS3C5PO3)	Comprehension strategies	Write a response that demonstrates an understanding of a reading selection		
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8th GRADE SCIENCE CURRICULUM MAP

QUARTER 3				
UNIT 7: HISTORY AND NATURE OF SCIENCE: NATURE OF SCIENTIFIC KNOWLEDGE				
Cluster 15				
Big Ideas/Enduring Understandings: Scientific knowledge is constantly changing as theories are challenged, new information is learned, and technology advances. Diverse people throughout history have made and will continue to make important contributions to scientific progress. A scientific break-through can have a profound impact on the environment and society in general.			Essential Question(s): What is scientific knowledge? Why are scientific theories challenged? In what ways are scientific theories challenged? How do scientific break-throughs impact the environment and society?	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		
<i>S2C2PO2</i>	<i>Scientific knowledge is subject to change (when new information and/or technology challenges theories)</i>	<u>Describe</u> how scientific knowledge is subject to change (when new information and/or technology challenges theories)	Diverse Chemistry	“GRASPS” Performance Task with Rubric/Scoring Guides [Students write from the perspective of a scientist or person living in another time period commenting on a scientific discovery and its effect on their society]
<i>S2C1PO1</i>	<i>Diverse people and/or cultures, past and present, have made important contributions to scientific innovations</i>	<u>Describe</u> how Dmitri Mendeleev made important contributions to scientific progress		
S2C1PO3	The impact of a major scientific development	<u>Evaluate</u> the impact of a major scientific development in chemistry within the past decade (e.g. greenhouse gases, chemical waste disposal)		
S2C1PO4	Career opportunities related to life and physical sciences	<u>Evaluate</u> career opportunities related to life and physical sciences		
(WS3C2PO3)	Explanatory essay	Write an explanatory essay that includes a thesis statement, supporting details, introductory, body, and concluding paragraphs		
(WS1C1)	Pre-writing strategies	Uses pre-writing to generate, plan, and organize ideas for specific purposes		

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8th GRADE SCIENCE CURRICULUM MAP

(WS1C5)	Formatting and presentation	Uses appropriate formatting and presentation of final product for intended audience		
(WS1C3)	Revision strategies and techniques	Uses revising strategies to revise, and refine the rough draft for clarity and effectiveness		
(WS2C3PO4)	Voice for the audience and purpose	Choose appropriate voice for the audience and purpose		

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8th GRADE SCIENCE CURRICULUM MAP

QUARTER 4				
Unit: Teacher Discretion: Review or Enrich				
All Performance Objectives must be taught to mastery prior to AIMS. Fourth quarter instruction must be based on the 8 th grade Science Standard. During the 4 th quarter the teacher may choose to remediate or enrich based on student performances and interests.				
Big Ideas/Enduring Understandings:			Essential Question(s):	
AZ Standard	Essential Learning		Key Vocabulary	Summative Assessment
	Knowledge	Skills		

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UNIT PLAN COVER PAGE

Teacher Name: Center For Teacher Success Team	
Unit Title: MOVE IT NEWTON: <i>Which law is it?</i>	Grade Level(s): 8
Subject/Topic: Science: Newton's Three Laws	Time Frame: 20 Class Periods
Correlation to Curriculum Map: (Cluster/Quarter) 2 nd Quarter, Unit 4A & B, Clusters 6, 7, 8, and 9	
<p>Brief Summary of Unit (Thematic/Conceptual Overview of Unit)</p> <p>In this unit, students will explore Newton's Three Laws of Motion. By studying objects and the forces that act upon them, students develop an understanding of the fundamental laws of motion. Students will examine each law respectively, then conceptualize their connections and applications to the real world. Reading, writing, and math standards will be reinforced within this unit.</p>	
<p>Primary Resources:</p> <p>IDEAL Portal</p> <p>Web sites for Newton's laws http://www.glenbrook.k12.il.us/GBSSCI/PHYS/CLASS/newtlaws/u211a.html http://www.usoe.k12.ut.us/curr/science/sciber00/8th/forces/sciber/newtons.htm http://www.brainpop.com/science/motionsandforces/newtonslawsofmotion/preview.weml http://id.mind.net/~zona/mstm/physics/mechanics/forces/newton/newton.html http://www.physics4kids.com/files/motion_laws.html</p> <p>Sir Isaac Newton: http://www.brainpop.com/science/motionsandforces/isaacnewton/preview.weml</p> <p>Science and Technology: Forces, Motion, and Energy (Holt)</p> <p>Lab kit</p>	

I. Identify Desired Results/Essential Learning

A. What key knowledge and skills will students acquire as a result of this unit?

Students will know (knowledge):

Scientific knowledge

Main idea (explicit and implicit) in expository text

Summary

Critical details

Newton's 1st Law of Motion

State of motion

Velocity

Rate of change

Position-time graphs

Velocity-time graphs

Controlled investigation

Hypothesis

Results and conclusion of an investigation

Newton's 2nd Law of Motion

Mass

Net applied force

Controlled investigation

Hypothesis

Results and conclusion of an investigation

Newton's 3rd Law of Motion

Forces

Interactions between bodies

Controlled investigation

Hypothesis

Results and conclusion of an investigation

Students will be able to (skills):

Describe how scientific knowledge changes with new info and/or technology

Restate main idea

Summarize main idea

Identify conditions under which a body will continue in motion

Demonstrate velocity

Create a graph

Identify variables

Predict the outcome of a situation involving the 1st Law

Conduct a controlled investigation

Formulate questions based on observations that lead to a hypothesis

Communicate the results and conclusion of the investigation

Describe how the acceleration of a body is dependent on mass and applied force

Differentiate among speed, velocity, acceleration

Calculate average velocity of an object given the formula for speed

Create a graph devised from measurements of moving objects and their interactions

Predict what will happen to variables when one increases or decreases ($F=ma$)

Identify situations demonstrating 2nd law

Predict the outcome of a situation involving 2nd Law

Conduct a controlled investigation

Formulate questions based on observations that lead to hypothesis

Communicate the results and conclusion of the investigation

Describe forces as interactions between bodies

Identify examples of action-reaction force pairs

Identify situations involving 3rd law

Predict the outcome of a situation involving 3rd law

Conduct a controlled investigation

Formulate questions based on observations that lead to hypothesis

Communicate the results and conclusion of the investigation

<p>Controlled investigation Hypothesis</p> <p><i>Controlled variable (constant)</i></p> <p><i>Scientific processes</i></p> <p>Control group Experimental group</p> <p><i>Know appropriate scientific tools (balances, microscopes, micrometers, probes)</i></p> <p><i>Scientific report</i> <i>Observation Record</i></p> <p>Possible investigational errors: Flawed investigational design, Computational error, Inaccurate measurement, Unethical reporting</p> <p>Principle of accurate record keeping, openness and replication</p> <p>Possible relationships between two variables</p> <p>True investigation</p> <p><i>Trends</i></p> <p><i>Graphic representation:</i> <i>Line graph, Double bar graph, Stem and leaf plot, Histogram</i></p> <p>Step by step instructions</p> <p><i>Results and conclusion of an investigation</i></p> <p>Information</p> <p>Summary</p>	<p><u>Conducting investigations</u></p> <p><i>Formulate questions</i> <i>Make observations</i> <i>Develop/generate a hypothesis</i></p> <p><i>Apply scientific processes to other problem solving decision making situations</i> <i>(Observing, Questioning, Communicating, Comparing, Measuring, Classifying, Predicting, Organizing data, Inferring, Generating hypotheses, Identifying variables)</i></p> <p><u>Conduct</u> a controlled investigation to support or reject a hypothesis <u>Operate</u> equipment <u>Identify</u> extraneous variables that need to be controlled <u>Identify</u> control and experimental groups <u>Design</u> an experiment to test a hypothesis</p> <p><u>Perform</u> measurements using appropriate tools</p> <p><u>Record</u> observations, notes, sketches, questions, and ideas using tools (written/computer)</p> <p><u>Identify</u> possible investigational errors</p> <p><u>Defend</u> the principle</p> <p><u>Interpret</u> data</p> <p><u>Formulate</u> a true investigation based on data</p> <p><u>Analyze</u> data <u>Identify</u> trends</p> <p><u>Choose</u> appropriate graphic representation</p> <p><u>Write</u> clear step-by-step instructions for conducting experiments or operating equipment (without personal pronouns) <u>Organize</u> data</p> <p><u>Communicate</u> the results and conclusion of the investigation</p> <p><u>Record</u> information</p> <p><u>Write</u> a summary based on information gathered</p>
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Template Adapted from Wiggins and McTighe, 2004.

IP 03-18-2010 Handout (Web)

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B. What big ideas/enduring understandings are uncovered?

Students will understand that:

Inertia is everywhere.

Forces are acting all around us.

Newton's Laws can explain all motion or the lack of motion in the universe.

The motion of an object is directly related to force.

Net force is dependent upon mass and acceleration.

The interdependence of motion, velocity, mass, and force is key to Newton's 3 Laws

The scientific method deliberately isolates and controls key variables and is not just "Trial and Error."

Scientific processes involve diverse and complex skills and thinking.

Scientists must be concerned with potential investigational errors.

Scientific claims must be verified by independent investigations.

C. What essential questions will be considered?

How do forces affect the motion of an object?

How do objects move?

Is it possible for an object to ever be completely at rest?

Of what value are Newton's Laws?

What is the relationship between force and motion?

How are motion, velocity, mass, and force interdependent?

How might investigational errors influence outcomes?

Why should experiments be repeated?

How do independent investigations validate scientific claims?

Why do scientific claims need to be verified?

In what ways are scientific processes both diverse and complex?

D. What key vocabulary will be mastered?

Isaac Newton

Expository text

Summary

Explicit/implicit

Critical details

Velocity

Physics

Inertia

Force

Motion

Reference point

Rate

Speed

Speed= $\frac{\text{distance}}{\text{time}}$

Acceleration

Negative acceleration

Mass

Net force

Force pairs

Action

Reaction

Constant acceleration

Constant velocity

Interactions

Hypothesis

Procedures

Scientific process

Variables

Extraneous variables

Control group

Flawed investigational design

Investigational error

Computational error

Inaccurate measurement

Unethical reporting

Openness

Replication

Credibility

Positive relationship

Negative relationship

No relationship

Trends

Line graph

Double bar graph

Stem and leaf plot

Histogram

II. Determine Acceptable Evidence of Achievement

A. What multiple and varied evidence will show that students mastered essential learning?

Summative Assessments with Rubrics/Scoring Guides/Keys and Anchors (performance, AIMS look alike, and traditional assessments from your Map)

Short answer with key: Physics Application Test (Day 15)

“Designer Experiments” (Days 16-20) [Performance Assessment]

Students answer questions regarding Newton’s 3 Laws with application to “real world.”

B. What additional evidence (class assignments, tests, prompts, observations, dialogues, work samples, homework, etc.) will be used to document student achievement?

- Frayer Model,
- Exit cards
- Lab work
- Flow Chart
- 1 minute essay
- Mind Map
- Motion Lab #1 (Day 4)
- “Laws Behind Sport” (Days 13 & 14)

C. How will student self-assessment and reflection be prompted?

- Scientific Log
- Effort-Achievement Charts
- Peer Feedback
- Use of rubric

PRE-ASSESSMENT FOR “MOTIONS AND FORCES”
(Unit 4A and B, clusters 6, 7, 8 and 9)

Definition	Facts/Characteristics
Examples	Non-examples

NEWTON'S LAWS

Template Adapted from Wiggins and McTighe, 2004.

IP 03-18-2010 Handout (Web)

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Blueprint for Performance Assessments

(One blueprint per performance assessment developed (II – A1))

**A. What essential learning (specific, knowledge, skills and big ideas/enduring understandings) will be assessed through this performance assessment?
(TARGETED ESSENTIAL LEARNING)**

Cluster 9 from the map

**B. What qualities or characteristics must student work demonstrate that the essential learning was mastered?
(OBSERVABLE EVIDENCE MASTERY OR HALLMARKS QUALITY)**

Application of scientific process

Follow standard lab and safety procedures

Demonstrate clear step by step directions

Report observations and data collected

Must include a graphic representation from organized data

**C. What assessment tool will be used and what specific task(s) will students be asked to demonstrate their mastery of essential learning?
(ASSESSMENT TOOL AND TASK)**

Tool: Students will conduct an experiment.

Task: “Designer Experiments” Response Sheet

Graphic representation of the results of their experiment

**D. What specific criteria will be used to judge the quality of student products/performances? How will the criteria be communicated (rubrics, checklists, scoring key, etc.)?
(EVALUATION CRITERIA AND SCORING TOOL)**

Student-generated rubric based on class discussion and teacher input. Students will technically own the rubric since they played a key role in creating it.

III. Plan Learning Experiences and Instruction

1	<p>Introduce key vocabulary: motion velocity, acceleration, mass and concepts (i.e. Newton and Gravity) for the unit</p> <p>Vocabulary learning experience</p>	2	<p>Who was Isaac Newton?</p> <p>Jigsaw: Students read, highlight, and share with team</p>	3	<p>Newton's 1st Law:</p> <ul style="list-style-type: none"> • Teacher overview • Student reading • Video Stream <p>Assign:</p> <ul style="list-style-type: none"> • <i>Jigsaw reading</i> • <i>Demonstration</i> • <i>Reflection as exit card</i> 	4	<p>Motion Lab #1</p>
5	<p>Newton's 2nd Law</p> <p>Calculating Force and Net Force</p> <p>Practice Problems</p> <ul style="list-style-type: none"> • Reading • Streaming Video 	6	<p>Correct practice problems in class</p> <p>Create a flow chart showing steps for solving problems for</p> <ul style="list-style-type: none"> • Force • Net Force 	7	<p>Quiz on vocabulary (mass, motion, velocity, acceleration, force), calculating force, and net force.</p> <p>Correct quiz in class</p>	8	<p>Motion Lab #2</p>
9	<p>Newton's 3rd Law</p> <ul style="list-style-type: none"> • Read using Graphic-Organizer • Demonstration • Formative Assessment: Exit Card 	10	<p>Motion lab #3</p>	11	<p>Learning Experience:</p> <ul style="list-style-type: none"> • Review of terms for 3 laws • Students create a visual representation of each term 	12	<p>Finish Learning Experience:</p> <ul style="list-style-type: none"> • Motion maps
13	<p>"Laws Behind Sports"</p>	14	<p>"Laws Behind Sports" continued</p>	15	<p>Physics Application Test (Summative Assessment)</p>	16	<p>Inquiry Process: Motions & Forces "Designer Experiments"</p>
17	<p>Inquiry Process: Motions and Forces "Designer Experiments"</p>	18	<p>Inquiry Process: Motions and Forces "Designer Experiments"</p>	19	<p>Inquiry Process: Motions and Forces "Designer Experiments"</p>	20	<p>Inquiry Process: Motions and Forces "Designer Experiments"</p>

III. Plan Learning Experiences and Instruction

<p>Introduce key vocabulary: motion velocity, acceleration, mass and concepts (i.e. Newton and Gravity) for the unit</p> <p>Vocabulary learning experience</p>	<p>Who was Isaac Newton?</p> <p>Jigsaw: Students read, highlight, and share with team</p>	<p>Newton's 1st Law:</p> <ul style="list-style-type: none"> • Teacher overview • Student reading • Video Stream <p>Assign:</p> <ul style="list-style-type: none"> • <i>Jigsaw reading</i> • <i>Demonstration</i> • <i>Reflection as exit card</i> 	<p>Motion Lab #1</p>
<p>Newton's 2nd Law: Calculating Force and Net Force</p> <p>Practice Problems</p> <ul style="list-style-type: none"> • Reading • Streaming Video 	<p>Correct practice problems in class</p> <p>Create a flow chart showing steps for solving problems for</p> <ul style="list-style-type: none"> • Force • Net Force 	<p>Quiz on vocabulary (mass, motion, velocity, acceleration, force), calculating force, and net force.</p> <p>Correct quiz in class</p>	<p>Motion Lab #2</p>
<p>Newton's 3rd Law</p> <ul style="list-style-type: none"> • Read using Graphic-Organizer • Demonstration • Formative Assessment: Exit Card 	<p>Motion Lab #3</p>	<p>Learning Experience:</p> <ul style="list-style-type: none"> • Review of terms for 3 laws • Students create a visual representation of each term 	<p>Finish Learning Experience:</p> <ul style="list-style-type: none"> • Motion maps
<p>Laws Behind Sports"</p>	<p>Laws Behind Sports" continued</p>	<p>Physics Application Test (Summative Assessment)</p>	<p>Inquiry Process: Motions and Forces "Designer Experiments"</p>
<p>Inquiry Process: Motions and Forces "Designer Experiments"</p>	<p>Inquiry Process: Motions and Forces "Designer Experiments"</p>	<p>Inquiry Process: Motions and Forces "Designer Experiments"</p>	<p>Inquiry Process: Motions and Forces "Designer Experiments"</p>



LESSON PLAN TEMPLATE #2

(Based on Dr. Madeline Hunter's EEI Model)

Lesson Plan Written By: Center For Teacher Success	
Grade: 8	
Time: 1 lesson (50 minutes)	Date: Unit Plan Day #2
Subject: Physics - Newton	Topics: Isaac Newton
Target/Objective(s) I will summarize and present the information I learned about Sir Isaac Newton to my teammates.	
Anticipatory Set <ol style="list-style-type: none"> 1. How many of you have heard about Sir Isaac Newton? 2. Why would Sir Isaac Newton be important to know about from a long time ago, some 400 years later? 3. Today you will read various pieces of research telling about his life and discoveries. As you read, you will see that his discoveries still impact our lives today. 	
Input <ul style="list-style-type: none"> • 3 research articles – jigsaw with expert groups • Assign roles to team members • Questions: Who was Sir Isaac Newton? What contributions did he make to our world today? 	
Modeling (<i>I do . . .</i>) Explicit directions of learning task.	
Guided Practice (<i>We do . . .</i>) Please think about the directions I just gave you ... share with a partner. Thumbs up, if you understand; thumbs across, if you're cloudy; or thumbs down, if you are confused.	
Independent Practice (<i>You do . . .</i>) Students read research article, highlight or underline key information, complete open ended response sheet, and prepare summary to share with teammates. Students present to group comparing information. Students review/ revise their response sheet.	
Closure Think back to the article you read and the information you heard from your teammates. Write a one sentence summary telling me what you learned about Sir Isaac Newton on the exit card provided.	
Formative Assessment: Teacher walks around room monitoring activities with a checklist. Teacher checks for understanding through the use of questions and analysis of student responses. Teacher observes progress, provides clarity and monitors for completion. Use of exit card.	
Materials: <ul style="list-style-type: none"> • 3 articles • Open response handout <ul style="list-style-type: none"> • Highlighters • Overhead with direction prompt • Exit card 	



Who Was Isaac Newton?

Name:

Date:

Period:

Directions:

1. Carefully read your assigned research article about Sir Isaac Newton.
2. Highlight or underline all of the important information.
3. Use the reading to help you complete the information below.
4. Summarize key points to share with teammates.

1. The **five** most important **events** in Newton's life:

2. The **five** most important **facts** about Isaac Newton:

3. The **three** most **interesting** details about Isaac Newton:

4. Explain the **impact** Isaac Newton had on:

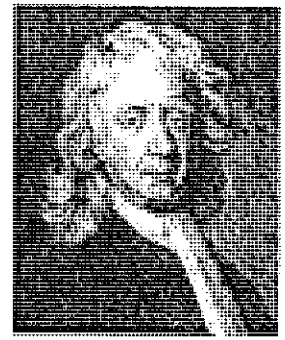
Science:

Society:

5. **Summarize** key information to be shared with teammates.

Jim Little

Who Was Isaac Newton?



Isaac Newton was born in 1642 in a manor house in Lincolnshire, England. His father had died two months before his birth. When Isaac was three his mother remarried, and Isaac remained with his grandmother. He was not interested in the family farm, so he was sent to Cambridge University to study.

Isaac was born just a short time after the death of Galileo, one of the greatest scientists of all time. Galileo had proved that the planets revolve around the sun, not the earth as people thought at the time. Isaac Newton was very interested in the discoveries of Galileo and others. Isaac thought the universe worked like a machine and that a few simple laws governed it. Like Galileo, he realized that mathematics was the way to explain and prove those laws. Isaac Newton was one of the world's great scientists because he took his ideas, and the ideas of earlier scientists, and combined them into a unified picture of how the universe works.

Isaac Newton explained the workings of the universe through mathematics. He formulated laws of motion and gravitation. These laws are math formulas that explain how objects move when a force acts on them. Isaac published his most famous book, *Principia*, in 1687 while he was a mathematics professor at Trinity College, Cambridge. In the *Principia*, Isaac explained three basic laws that govern the way objects move. He then described his idea, or theory, about gravity. Gravity is the force that causes things to fall down. If a pencil falls off a desk, it will land on the floor, not the ceiling. In his book Isaac also used his laws to show that the planets revolve around the suns in orbits that are oval, not round. Isaac Newton used three laws to explain the way objects move. They are often called Newton's Laws.

When most people think of Isaac Newton, they think of him sitting under an apple tree observing an apple fall to the ground. When he saw the apple fall, Newton began to think about a specific kind of motion—gravity. Newton understood that gravity was the force of attraction between two objects. He also understood that an object with more matter—mass—exerted the greater force, or pulled smaller object toward it. That meant that the large mass of the earth pulled objects toward it. That is why the apple fell down instead of up, and why people don't float in the air.

Isaac Newton thought about gravity and the apple. He thought that maybe gravity was not just limited to the earth and the objects on it. What if gravity extended to the moon and beyond? Isaac calculated the force needed to keep the moon moving around the earth. Then he compared it with the force that made the apple fall downward. After allowing for the fact that the moon is much farther from the earth, and has a much greater mass, he discovered that the forces were the same. The moon is held in an orbit around earth by the pull of earth's gravity.

Isaac Newton's calculations changed the way people understood the universe. No one had been able to explain why the planets stayed in their orbits. What held them up? Less than 50 years before Isaac Newton was born it was thought that the planets were held in place by an invisible shield. Isaac proved that they were held in place by the sun's gravity. He also showed that the force of gravity was affected by distance and by mass. He was not the first to understand that the orbit of a planet was not circular, but more elongated, like an oval. What he did was to explain how it worked.

Who Was Isaac Newton?



Isaac Newton was born on 4 January 1643 in Woolsthorpe, Lincolnshire. His father was a prosperous farmer, who died three months before Newton was born. His mother re-married and Newton was left in the care of his grandparents. In 1661, he went to Cambridge University where he became interested in mathematics, optics, physics and astronomy. In October 1665, a plague epidemic forced the university to close and Newton returned to Woolsthorpe. The two years he spent there were an extremely fruitful time during which he began to think about gravity, and also devoted time to optics and mathematics, working out his ideas about 'fluxions' (calculus).

In 1667, Newton returned to Cambridge, where he became a fellow of Trinity College. Two years later he was appointed second Lucasian Professor of Mathematics. It was Newton's reflecting telescope, made in 1668, that finally brought him to the attention of the scientific community and in 1672 he was made a Fellow of the Royal Society. From the mid-1660s, Newton conducted a series of experiments on the composition of light, discovering that white light is composed of the same system of colors that can be seen in a rainbow and establishing the modern study of optics (or the behavior of light). In 1704 Newton published 'The Opticks' which dealt with light and color. He also studied and published works on history, theology and alchemy.

However, in 1687, with the support of his friend the astronomer Edmond Halley, Newton published his single greatest work, the 'Philosophiae Naturalis Principia Mathematica' ('Mathematical Principles of Natural Philosophy'). This showed how a universal force, gravity, applied to all objects in all parts of the universe.

In 1689, Newton was elected MP for Cambridge University (1689 - 1690 and 1701 - 1702). In 1696 Newton was appointed warden of the Royal Mint, settling in London. He took his duties at the Mint very seriously and campaigned against corruption and inefficiency within the organization. In 1703, he was elected president of the Royal Society, an office he held until his death. He was knighted in 1705.

Newton was a difficult man, prone to depression and often involved in bitter arguments with other scientists, but by the early 1700s he was the dominant figure in British and European science. He died on 31 March 1727 and was buried in Westminster Abbey.

Who Was Isaac Newton?



Sir Isaac Newton, an English scientist, changed the way we look at the world. He made many discoveries in astronomy, mathematics, and physics, which is the study of matter and energy. He is most famous for his work on gravity, or the force that pulls, or attracts, objects to the ground. Some say he figured this out by watching an apple drop from a tree, but others question whether or not this really happened.

Newton was born on December 25, 1642, in Woolsthorpe, Lincolnshire, England. He graduated from Trinity College (which is part of Cambridge University) in 1665. Around this time he wrote out a proof about the law of gravity, which was published about twenty years later as *Philosophiae Naturalis Principia Mathematica* (usually called *Principia*). In this groundbreaking 1687 three-volume publication, Newton discussed how the planets move, how there are forces at work that hold the universe together, and other scientific ideas. He established several rules, which are now known as Newton's Laws of Motion. His revolutionary work got other scientists thinking about how the universe works and about the physical rules that affect life on Earth.

Another important work by Newton was *Opticks*. Published in 1704, this work covers his experiments to better understand the relationship between light and color. He showed how light can be bent or changed to create different colors and how different colored light can change what color we see, such as a yellow light on a blue piece of paper.

Along with his scientific research, Newton worked as a professor of mathematics at Cambridge from 1669 to 1701. He developed new field of mathematics called calculus and made other mathematical discoveries. Newton was also interested in religion and alchemy, a science that involves trying to change metals into gold.

In addition to his studies and hobbies, Newton served as a member of Parliament, part of the English government. He later became president of the Royal Society, an important science organization, in 1703 and remained its leader until his death. Two years later, he was knighted by Queen Anne, which made him "Sir Isaac Newton."

Newton died on March 20, 1727. He was buried in Westminster Abbey, a famous place of worship where many kings and other important figures have been laid to rest. Newton became the first scientist to receive such an honor. Newton is considered one of the greatest scientists of all time and is often called the father of modern science. His discoveries have influenced the work of later scientists, such as Albert Einstein.

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