



LAB-AIDS Correlations for
NEXT GENERATION SCIENCE STANDARDS
MIDDLE SCHOOL LEVEL – GRADES 6-8¹

Oralia Gil, Curriculum Specialist, LAB-AIDS
Mark Koker, Ph D, Director of Curriculum & Professional Development, LAB-AIDS

This document is intended to show how our SEPUP curriculum products align with the *Next Generation Science Standards*² and Common Core documents. SEPUP project staff provided information that was very helpful in our production of this document, but LAB-AIDS takes sole responsibility for its content and final appearance.

ABOUT OUR PROGRAMS

LAB-AIDS Core Science Programs are developed to support current knowledge on the teaching and learning of science. All materials support an inquiry-driven pedagogy, with support for literacy skill development and with assessment programs that clearly show what students know and are able to do from using the programs. All programs have extensive support for technology in the school science classrooms, and feature comprehensive teacher support. For more information please visit www.lab-aids.com and navigate to the program of interest.

SEPUP

Materials from the Science Education for Public Understanding Program (SEPUP) are developed at the Lawrence Hall of Science, at the University of California, Berkeley, and distributed nationally by LAB-AIDS, Inc. Development of SEPUP materials is supported by grants from the National Science Foundation. SEPUP programs are available as full year courses, or separately, as units, each taking 3-9 weeks to complete, as listed below.

Middle Level, Grades 6-8

Issues and Earth Science, Second Edition (IAES)

Unit Title	Activity Number
Studying Soil Scientifically	1-11
Rocks and Minerals	12-23
Erosion and Deposition	24-35

¹ This document was first posted January, 2015

² <http://www.nextgenscience.org/next-generation-science-standards>

Plate Tectonics	36-49
Weather and Atmosphere	50-70
The Earth in Space	71-84
Exploring Space	85-98

Issues and Life Science, Second Edition (IALS)

Unit Title	Activity Number
Experimental Design: Studying People Scientifically	1-10
Body Works	11-29
Cell Biology and Disease	30-53
Genetics	54-71
Ecology	72-88
Evolution	89-101
Bioengineering	102-109

Issues and Physical Science, Second Edition (IAPS)

Unit Title	Activity Number
Studying Materials Scientifically	1-11
The Chemistry of Materials	12-29
Water	30-52
Energy	53-72
Force and Motion	73-88
Waves	89-99

Each of the full year programs begins with a “starter” unit sequence on the scientific method in the context of each particular discipline. For example, the Issues and Life Science (IALS) course contains a ten- activity unit called “Experimental Design: Studying People Scientifically,” which uses the science behind clinical trials on human subjects, to frame the study of the life sciences. These are listed first in each course.

ABOUT THE NEXT GENERATION SCIENCE STANDARDS

The National Academy of Sciences, Achieve, the American Association for the Advancement of Science, and the National Science Teachers Association have collaborated over several years to develop the *Next Generation Science Standards* (NGSS). The first step of the process was led by The National Academies of Science, a non-governmental organization commissioned in 1863 to advise the nation on scientific and engineering issues. On July 19, 2011, the National Research Council (NRC), the functional staffing arm of the National Academy of Sciences, released the *Framework for K-12 Science Education*.

The *Framework* was a critical first step because it is grounded in the most current research on science and science learning and it identifies the science all K–12 students should know. The second step in the process was the development of standards grounded in the NRC Framework. A group of 26 lead states and writers, in a process managed by Achieve, has been working since the release of the Framework to develop K-12 *Next Generation Science Standards*. The *Standards* have undergone numerous lead states and all state reviews as well as two public comment periods, the most recent of these in January, 2013. The final release of the Standards coincided with the National Conference of the National Science Teachers Association Annual Conference in San Antonio, TX, the week of April 8, 2013.

The *Next Generation Science Standards* (NGSS) provide an important opportunity to improve not only science education but also student achievement. Based on the *Framework for K–12 Science Education*, the NGSS are intended to reflect a new vision for American science education. *The Next Generation Science Standards* are student performance expectations – NOT curriculum. Even though within each performance expectation Science and Engineering Practices (SEP) are partnered with a particular Disciplinary Core Idea (DCI) and Crosscutting Concept (CC) in the NGSS, these intersections do not predetermine how the three are linked in curriculum, units, or lessons. Performance expectations simply clarify the expectations of what students will know and be able to do by the end of the grade or grade band.

As the reader knows, the *Standards* represent content from several domains: (1) science and engineering practices; (2) cross-cutting concepts; (3) the disciplines of life, earth, and physical science, as set forth in the *Next Generation Science Framework* (NRC, 2012). The Standards themselves are written as performance indicators, and content from the Common Core (<http://www.corestandards.org/>) is included. The following middle level standard from the life sciences is used to show the basic structure. Standards, as performance indicators, are in the white box on top, and the relevant Practices, Disciplinary Core Ideas, and Crosscutting Concepts are listed below in the blue, orange, and green boxes, respectively. Clarification Statements, in red, list assessment boundaries or further describe the standard; statements marked with an asterisk (*) denote integration of engineering content.

MS-LS3 Heredity: Inheritance and Variation of Traits

MS-LS3 Heredity: Inheritance and Variation of Traits		
<p>Students who demonstrate understanding can:</p> <p>MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]</p> <p>MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]</p> <p>The performance expectations above were developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i>.</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models</p> <p>Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.</p> <ul style="list-style-type: none"> Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2) 	<p>LS1.B: Growth and Development of Organisms</p> <ul style="list-style-type: none"> Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (<i>Secondary to MS-LS3-2</i>) <p>LS3.A: Inheritance of Traits</p> <ul style="list-style-type: none"> Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1) Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2) <p>LS3.B: Variation of Traits</p> <ul style="list-style-type: none"> In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2) In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1) 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2) <p>Structure and Function</p> <ul style="list-style-type: none"> Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)
<p><i>Connections to other DCIs in this grade-band:</i> MS.LS1.A (MS-LS3-1); MS.LS4.A (MS-LS3-1)</p> <p><i>Articulation across grade-bands:</i> 3.LS3.A (MS-LS3-1),(MS-LS3-2); 3.LS3.B (MS-LS3-1),(MS-LS3-2); HS.LS1.A (MS-LS3-1); HS.LS1.B (MS-LS3-1),(MS-LS3-2); HS.LS3.A (MS-LS3-1),(MS-LS3-2); HS.LS3.B (MS-LS3-1),(MS-LS3-2)</p> <p><i>Common Core State Standards Connections:</i></p> <p>ELA/Literacy –</p>		

Various other appendices describe other important elements of the Standards, such as DCI progressions, STS, nature of science, and more.

ABOUT THE LAB-AIDS CITATIONS

The following tables are presented in a Disciplinary Core Idea arrangement – Earth Space Science (ESS), Life Science (LS), Physical Science (PS) and Engineering, Technology and Applications of Science (ETS). This document is intended as a summary document to show the NGSS and Common Core ELA/Math alignment as of January 2015, and is based on input from the SEPUP staff. As of this writing, SEPUP has plans to post more details on their own internal NGSS review and alignment process on their project website (www.sepuplhs.org) later in 2015. In addition, not all SEPUP 6-8 units listed on pages 1-2 may appear here, as some may contain science content that falls outside NGSS specifications.

Citations included in the correlation document are as follows:

Unit title, Activity Number and Description:

The Chemistry of Materials, 14 LABORATORY Physical and Chemical Properties of Materials
Students test and group 6 different materials based on their chemical and physical properties.

NGSS Performance Expectations	MS-PS1-2
Science and Engineering Practices	Planning and Carrying Out Investigations
Crosscutting Concepts	(Structure and Function)*
Disciplinary Core Ideas	PS1.A
Common Core English-Language Arts	RST.6-8.3
Common Core Mathematics	

*The use of parenthesis () indicates partial coverage.

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Body Works					
17 LABORATORY: Gas Exchange Students analyze the content of a fictional newspaper story that describes the alleged discovery of diamonds in a national forest.	MS-LS1-3	Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	Patterns Systems and System Models	LS1.A PS3.D	MATH: (6.SP.A.2); (6.SP.B.4)
18 MODELING: The Circulation Game Students quantitatively measure the amount of carbon dioxide in their exhaled breath by using an indicator to perform a titration. [Includes web-activity about the nervous system for those using Unit B only.]	MS-LS1-3	Developing and Using Models	Systems and System Models	LS1.A	
19 INVESTIGATION: Heart-ily Fit Students collect data on their heart rates and recovery times as a quantitative measure of physical fitness.		Analyzing and Interpreting Data Using Mathematics and Computational Thinking	Patterns	LS1.A	MATH: (6.SP.A.2); (6.SP.B.4); (MP.4)
20 ROLE PLAY: Great-Aunt Lily's Will After performing a role play, students decide on the best use of limited funds to fight heart disease and promote public health.		Engaging in Argument from Evidence			(SL.8.4); (SL.8.5)
21 LABORATORY: Inside A Pump Students explore the role of valves in the heart by using different pumps as potential models.		Developing and Using Models		LS1.A	
22 LABORATORY: The Heart—A Muscle Students investigate the strength of heart muscle as they attempt to pump water at their resting pulse rate.		Analyzing and Interpreting Data Developing and Using Models		LS1.A	
23 READING: Heart Parts Students read about the structures and functions of the human circulatory system. [An optional				LS1.A	WHST.6-8.7; WHST.6-8.9; RST.6-8.7; RST.6-8.4; RST.6-8.9

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Body Works					
sheep's heart dissection is described in the Teacher's Edition.]					
24 MODELING: Round and Round In groups, students use pumps to design a working model of the human circulatory system.		Developing and Using Models			WHST.6-8.9; (SL.8.4); (SL.8.5); RST.6-8.9
25 READING: Healing the Heart Students read about the history of heart surgery and explore challenges of past and future heart surgery.		Obtaining, Evaluating, and Communicating Information			(RST.6-8.2); WHST.6-8.2
26 INVESTIGATION: Heart Sounds After an introduction to specific heart problems, students listen to normal and abnormal heart sounds.		Obtaining, Evaluating, and Communicating Information	(Cause and Effect)		WHST.6-8.7; RST.6-8.7
27 LABORATORY: The Pressure's On Students model the effects of high blood pressure on the circulatory system using clamps on the pump simulation.		Developing and Using Models			MATH: (6.SP.B.4)
28 READING: Heart Problems Students read about the physiological causes of high blood pressure, heart disease, and heart attacks.			(Cause and Effect) Stability and Change Systems and System Models		WHST.6-8.7; WHST.6-8.9; RST.6-8.7
29 PROJECT: Helping Hearts After taking a heart risk quiz, students design a public health brochure about a risk factor for heart disease.		Engaging in Argument from Evidence			(SL.8.1); (SL.8.4); (SL.8.5)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Cell Biology and Disease					
30 MODELING: It's Catching! As a class, students model and then analyze the spread of an infectious disease.		Developing and Using Models Analyzing and Interpreting Data	Patterns		MATH: (6.SP.B.4); (6.SP.B.5)
31 PROJECT: The Range of Disease After a scavenger hunt, students begin researching a disease and eventually produce a public service announcement on disease.		Obtaining, Evaluating, and Communicating Information			WHST.6-8.7; WHST.6-8.8; (SL.8.5); (SL.8.4)
32 INVESTIGATION: Who Infected Whom? Students develop and test hypotheses about the path of disease transmission in a fictional situation.		Engaging in Argument from Evidence	Patterns		WHST.6-8.1
33 VIEW AND REFLECT: From One to Another Students view a video segment on the outbreak and investigation of bubonic plague in San Francisco, CA during the 1900s.					
34 TALKING IT OVER: The Story of Leprosy Students read about the history of leprosy before discussing societal responses to infectious disease.		Engaging in Argument from Evidence			WHST.6-8.1; WHST.6-8.9; (RST.6-8.2); (SL.8.1); WHST.6-8.2
35 LABORATORY: A License to Learn After earning a microscope license, students use microscopes to examine every day materials.	(MS-LS1-1)		Scale, Proportion, and Quantity Structure and Function		
36 LABORATORY: Looking for Signs of Micro-Life Students prepare a wet mount slide and use microscopes to search for microscopic life.	(MS-LS1-1)		Scale, Proportion, and Quantity Structure and Function		
37 ROLE PLAY: The History of the Germ Theory of Disease Students role-play different scientists and their			Scale, Proportion, and Quantity	LS1.A	WHST.6-8.9; WHST.6-8.7; (SL.8.4); RST.6-8.7

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Cell Biology and Disease					
contributions to developing ideas about disease.			Structure and Function Cause and Effect		
38 LABORATORY: Microbes, Plants, and You Students stain plant cells and compare the structure to a microbial cell and a human cell.	MS-LS1-1		Scale, Proportion, and Quantity Structure and Function	LS1.A	
39 LABORATORY: Cells Alive! Students investigate the ability of cells to respire, using yeast.	MS-LS1-7	Analyzing and Interpreting Data		LS1.A LS1.C (PS3.D)	
40 MODELING: A Cell Model Students construct a cell model and explore the function of the cell membrane.	MS-LS1-2	Developing and Using Models Analyzing and Interpreting Data	Structure and Function	LS1.A	
41 MODELING: A Cell So Small Students investigate why cells are small, using a model of carbon and blue dye.	MS-LS1-2 MS-LS1-7	Developing and Using Models	Structure and Function	LS1.A LS1.C (PS3.D)	
42 READING: A Closer Look Students read about basic cell structures and their functions within plant and animal cells. On-line extensions show cell animations and electron micrographs.	MS-LS1-3 MS-LS1-7		Structure and Function Systems and System Models	LS1.A LS1.C (PS3.D)	WHST.6-8.9; WHST.6-8.7; (RST.6-8.4); RST.6-8.7
43 LABORATORY: Microbes Under View Students view prepared slides of protists and bacteria to help identify distinguishing characteristics.	MS-LS1-1		Scale, Proportion, and Quantity Structure and Function	LS1.A	
44 INVESTIGATION: Who's Who? Students classify cards containing images and information about different microbes using a dichotomous key.			Scale, Proportion, and Quantity	LS1.A	

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Cell Biology and Disease					
45 READING: The World of Microbes A reading about protists, bacteria, and viruses and how they are classified.			Structure and Function	LS1.A	RST.6-8.1; (RST.6-8.4) WHST.6-8.2; WHST.6-8.9; WHST.6-8.7; RST.6-8.7
46 INVESTIGATION: Disease Fighters Students view prepared slides of normal human blood and perform simulated tests for blood-type compatibility.					
47 LABORATORY: Reducing Risk Students investigate the effects of various antimicrobial solutions on the growth of common bacteria.		Analyzing and Interpreting Data			
48 INVESTIGATION: Wash Your Hands, Please! Students design an experiment to reduce the number of microbes found on their hands after hand washing.					
49 ROLE PLAY: An Ounce of Prevention Students perform a role play on the use of vaccines and antibiotics in the treatment and prevention of infectious disease.		Engaging in Argument from Evidence			(SL.8.1)
50 VIEW AND REFLECT: Fighting Back Students view a video segment on the development of the first antibiotic: penicillin.					
51 MODELING: The Full Course Students model the effects of antibiotics on the population of the disease-causing bacteria during an infection.		Analyzing and Interpreting Data Using Mathematics and Computational Thinking	Cause and Effect Patterns		MATH: (6.SP.B.4); (6.SP.B.5)
52 TALKING IT OVER: Miracle Drugs—or Not? Students read about the use and misuse of antibiotics before discussing the responsibilities of patients.					RST.6-8.1; WHST.6-8.2; WHST.6-8.9
53 INVESTIGATION: Modern Outbreaks		Engaging in	Cause and Effect		WHST.6-8.1; (SL.8.1)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Cell Biology and Disease					
Students collect data and develop hypotheses about disease transmission while playing a board game.		Argument from Evidence	(Patterns)		

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Genetics					
54 INVESTIGATION: Investigating Human Traits Students collect data on six human characteristics and discuss causes of human variation.		Analyzing and Interpreting Data	Patterns		(SL.8.1) MATH: (6.SP.A.2); (6.SP.B.4)
55 LABORATORY: Plants Have Genes, Too! Students germinate seeds and use information about the parent plants to predict offspring color.	MS-LS1-5		Cause and Effect Patterns	LS1.B LS3.A LS3.B	(RST.6-8.4)
56 VIEW AND REFLECT: Joe's Dilemma After reading a fictional story about a child who may have the Marfan syndrome, students watch a video on this genetic disease.					(RST.6-8.4); WHST.6-8.9; RST.6-8.9
57 READING: Reproduction Students read about the differences between sexual and asexual reproduction at the cellular level.	MS-LS3-2 MS-LS4-5			LS1.B LS3.A	RST.6-8.1; (RST.6-8.2); WHST.6-8.2; WHST.6-8.9; WHST.6-8.7; (RST.6-8.4); RST.6-8.7
58 MODELING: Creature Features Students develop models to investigate the inheritance of a trait in imaginary creatures.		Developing and Using Models Engaging in Argument from Evidence	Cause and Effect	LS1.B LS3.A LS3.B	WHST.6-8.1; WHST.6-8.9; (SL.8.1)
59 INVESTIGATION: Gene Combo Students model the inheritance of single-gene traits by collecting and analyzing data from coin tosses.	MS-LS3-2	Developing and Using Models Using Mathematics and Computational Thinking	Cause and Effect Patterns	LS1.B LS3.A LS3.B	(RST.6-8.4) MATH: MP.4; (6.RP.A.1); (7.RP.A.2)
60 READING: Mendel, First Geneticist Students read about Gregor Mendel's experiments with pea plants.		Using Mathematics and Computational Thinking	Cause and Effect Patterns	LS1.B LS3.A LS3.B	WHST.6-8.9; WHST.6-8.7; RST.6-8.7; RST.6-8.9 MATH: MP.4; (6.RP.A.1); (7.RP.A.2)
61 PROBLEM SOLVING: Gene Squares	MS-LS3-2	Developing and Using	Cause and Effect	LS1.B	(RST.6-8.4); 7.RP.A.2

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Genetics					
Students use Punnett squares to predict the approximate frequencies of traits among offspring.		Models Using Mathematics and Computational Thinking		LS3.A LS3.B	MATH: MP.4; (6.RP.A.1)
62 LABORATORY: Analyzing Genetic Data Students quantify and analyze results of the seeds germinated in Activity 55. [optional web based activity on Life Cycles of Plants and Animals, including a flower dissection.]	MS-LS1-5	Engaging in Argument from Evidence Analyzing and Interpreting Data	Cause and Effect	LS1.B LS3.A LS3.B	(SL.8.1); WHST.6-8.9; RST.6-8.9 MATH: (6.SP.B.5); MP.4; (6.RP.A.1); (7.RP.A.2)
63 READING: Show Me the Genes! Students read about the behavior of chromosomes and the function of DNA during sexual reproduction. [optional web based activity on Human Reproduction]	MS-LS3-1 MS-LS3-2		Cause and Effect (Stability and Change)	LS1.B LS3.A LS3.B	WHST.6-8.7; RST.6-8.7
64 LABORATORY: Nature and Nurture Students design an experiment to investigate the effect of the environment on seedling color.	MS-LS1-5	Analyzing and Interpreting Data	Cause and Effect	LS1.B LS3.B LS4.B	MATH: MP.4; (6.RP.A.1); (7.RP.A.2)
65 INVESTIGATION: Breeding Critters—More Traits Students create imaginary critter offspring to model patterns of inheritance.	(MS-LS1-5) MS-LS3-2	Developing and Using Models	Cause and Effect	LS1.B LS3.B	(RST.6-8.4) MATH: MP.4
66 PROBLEM-SOLVING: Patterns in Pedigrees Students use Punnett squares and pedigrees to analyze patterns of inheritance.	MS-LS3-2	Engaging in Argument from Evidence Analyzing and Interpreting Data	Cause and Effect Patterns	LS1.B LS3.B	(RST.6-8.4); WHST.6-8.9; (SL.8.1)
67 TALKING IT OVER: What Would You Do? Students re-visit the Marfan scenario from Activity 56 and discuss the trade-offs of genetic testing.		Engaging in Argument from Evidence			WHST.6-8.9; (SL.8.1); (WHST.6-8.8); WHST.6-8.7 Math:(6.SP.B.5)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Genetics					
68 INVESTIGATION: Searching for the Lost Children After being introduced to a story about children lost during war, students apply blood group genetics to evaluating parent/child matches.			Cause and Effect	LS3.B	WHST.6-8.7; RST.6-8.7
69 MODELING: Evidence from DNA Students perform a DNA fingerprinting simulation to generate different-sized pieces of DNA.					(RST.6-8.4); (WHST.6-8.8); WHST.6-8.7
70 INVESTIGATION: Finding the Lost Children Students use DNA fingerprints to gather additional evidence about the lost children introduced in Activity 68.		Engaging in Argument from Evidence			WHST.6-8.1
71 TALKING IT OVER: Should We? Students learn about the work of Dr. Mary-Claire King, who helped families in Argentina find their lost children and explore the ethics of using genetic information.		Engaging in Argument from Evidence			(SL.8.1); (WHST.6-8.8); WHST.6-8.7

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology					
72 TALKING IT OVER: The Miracle Fish? Students read and discuss what happened after the Nile perch was introduced into Lake Victoria.	MS-LS2-1 MS-LS2-2 MS-LS2-4	Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	Cause and Effect Patterns Stability and Change	LS2.A LS2.C LS4.D	WHST.6-8.1; WHST.6-8.9; (SL.8.1)
73 PROJECT: Introduced Species After learning about eight species that have been introduced into the U.S., students begin research to be presented later in the unit (see Activity 88).	MS-LS2-2	Obtaining, Evaluating, and Communicating Information	Stability and Change	LS2.A LS2.C LS4.D	WHST.6-8.7; WHST.6-8.9; WHST.6-8.8; SL.8.4
74 LABORATORY: Observing Organisms Students investigate the behavior of living organisms (blackworms).				LS2.A	
75 INVESTIGATION: Classifying Animals Students classify cards containing images and information on different animals.		Engaging in Argument from Evidence (Obtaining, Evaluating, and Communicating Information)	Stability and Change		WHST.6-8.9; RST.6-8.7; (SL.8.1)
76 INVESTIGATION: People, Birds, and Bats Students act as taxonomists as they apply characteristics of five major vertebrate classes to “mystery” organisms. [Includes an optional web-activity on the life cycles of plants and animals, with flower dissection extension.].		(Obtaining, Evaluating, and Communicating Information)		(LS2.C)	WHST.6-8.9
77 INVESTIGATION: Ups and Downs Students graph and interpret population data over time.	MS-LS2-1 MS-LS2-4	Analyzing and Interpreting Data Using Mathematics and Computational	Cause and Effect Patterns Stability and	LS2.A LS2.C LS4.D	MATH: (6.SP.B.4); (6.SP.B.5)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology					
		Thinking	Change		
78 LABORATORY: Coughing Up Clues Students gather information on owl diets and the owl's place in a food web as they dissect owl pellets.	MS-LS2-2 MS-LS2-3		Energy and Matter	LS2.A LS2.B	
79 READING: Eating for Energy Students read about the introduction of zebra mussels in the Great Lakes highlighting energy relationships within an ecosystem.	MS-LS1-7 MS-LS2-2 MS-LS2-3		Energy and Matter Patterns Stability and Change	LS1.C LS2.A LS2.B LS4.D PS3.D	RST.6-8.1; WHST.6-8.2; WHST.6-8.9; RST.6-8.7
80 LABORATORY: Nature's Recyclers Students investigate the role of decomposers as they isolate and examine nematodes. Extensions explore various food webs.	MS-LS2-2 MS-LS2-3		Energy and Matter	LS2.A LS2.B	(RST.6-8.4)
81 LABORATORY: A Producer's Source of Energy After collecting evidence for plant photosynthesis, students design and conduct an experiment on the role of light in photosynthesis.	MS-LS1-6 MS-LS2-3	Planning and Carrying Out Investigations	Energy and Matter	LS1.C LS2.A PS3.D	
82 LABORATORY: The Cells of Producers Students view microscope slides of different plant structures and compare photosynthetic and non-photosynthetic cells.	MS-LS1-1 MS-LS1-6		Energy and Matter Structure and Function Systems and System Models	LS1.A LS1.C	WHST.6-8.9
83 LABORATORY: A Suitable Habitat Students design an experiment to explore blackworms' response to various substrata. They read about biomes, populations, and communities and ecosystems. A web extension explores symbiotic relationships among species.	MS-LS2-2	Asking Questions and Defining Problems (Obtaining, Evaluating, and Communicating Information)		LS2.A LS2.C	RST.6-8.1; (RST.6-8.2); WHST.6-8.2; WHST.6-8.9

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology					
		Planning and Carrying Out Investigations			
84 MODELING: Clam Catch As a class, students model the interaction of a population of clams and zebra mussels.	MS-LS2-2	Analyzing and Interpreting Data Developing and Using Models Using Mathematics and Computational Thinking	Cause and Effect Patterns Stability and Change	LS2.A LS2.C	MATH: (6.SP.B.4); (6.SP.B.5)
85 READING: Is There Room for One More? Students read about the concept of carrying capacity using the example of the zebra mussel.	MS-LS2-1 MS-LS2-4	Analyzing and Interpreting Data Obtaining, Evaluating, and Communicating Information Using Mathematics and Computational Thinking	Patterns Stability and Change	LS2.A LS2.C	WHST.6-8.9
86 FIELD STUDY: Taking A Look Outside Students act as ecologists as they investigate the natural world.		Asking Questions and Defining Problems		(LS2.C)	(SL.8.4)
87 TALKING IT OVER: Too Many Mussels? After reading about different ways to address zebra mussel introduction in the U.S., students discuss the trade-offs of the recommendations	MS-LS2-1 MS-LS2-4 MS-LS2-5	Engaging in Argument from Evidence	Cause and Effect Stability and Change	LS2.A LS2.C LS4.D	(SL.8.1)
88 PROJECT: Presenting the Facts Student groups present their introduced species research and discuss what, if anything, should be done about the population of their introduced	MS-LS2-1 MS-LS2-4	Analyzing and Interpreting Data Engaging in		LS2.C LS4.D	WHST.6-8.7, (SL.8.5), (SL.8.1); (SL.8.4); WHST.6-8.8

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
<i>Ecology</i>					
species in the U.S.		Argument from Evidence Obtaining, Evaluating, and Communicating Information			

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Evolution					
89 TALKING IT OVER: Here Today, Gone Tomorrow? After reading about extinct mammoths and modern elephants, students discuss whether efforts should be made to save endangered elephants.		Engaging in Argument from Evidence	Patterns	LS4.A	RST.6-8.1; (RST.6-8.2); WHST.6-8.2; WHST.6-8.7; (SL.8.1); RST.6-8.7
90 LABORATORY: Figuring Out Fossils Students examine eight different fossils as evidence for extinct species		Engaging in Argument from Evidence		LS4.A	
91 INVESTIGATION: Fossilized Footprints Students interpret a series of fossilized footprints, differentiating between observations and inferences		Engaging in Argument from Evidence Analyzing and Interpreting Data		LS4.A	(SL.8.1)
92 MODELING: Time for Change Students develop a geologic-style personal time scale and then construct a geologic time scale.	MS-LS4-1			LS4.A	MATH: (6.RP.A.3)
93 INVESTIGATION: Reading the Rocks Students examine simulated drill cores in order to develop a stratigraphic column.	MS-LS4-1			LS4.A	
94 ROLE PLAY: A Meeting of Minds Students role-play an imaginary meeting between Charles Darwin and Jean-Baptiste Lamarck, who present and compare their theories on how evolution occurred..			Cause and Effect	LS4.B LS4.C	WHST.6-8.7; RST.6-8.7; WHST.6-8.9; RST.6-8.9
95 MODELING: Hiding in the Background Students use colored toothpicks to model the effect of environment and predation in the process of natural selection.	MS-LS4-4 MS-LS4-6	Developing and Using Models Using Mathematics and Computational Thinking	Cause and Effect	LS4.B LS4.C	RST.6-8.9; WHST.6-8.9 MATH: (6.SP.B.5); MP.4; (6.RP.A.1); (7.RP.A.2)
96 MODELING: Battling Beaks Students simulate the effect of natural selection	MS-LS4-4 MS-LS4-6	Developing and Using Models	Cause and Effect	LS4.B LS4.C	MATH: (6.SP.B.4); (6.SP.B.5); MP.4;

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Evolution					
on an imaginary species of “forkbirds.”		Using Mathematics and Computational Thinking Analyzing and Interpreting Data			(6.RP.A.1); (7.RP.A.2); WHST.6-8.9; RST.6-8.9
97 READING: Origins of Species Students read about mutations and how they provide the genetic variation necessary for natural selection.	MS-LS4-4		Stability and Change	LS3.B (LS4.A) LS4.B LS4.C	RST.6-8.1; RST.6-8.7; WHST.6-8.2; WHST.6-8.9; WHST.6-8.7
98 INVESTIGATION: Family Histories Students draw and interpret graphs showing changes in the numbers of fossil families in the fish, reptile, and mammal classes over geological time.	MS-LS4-1 MS-LS4-6	Engaging in Argument from Evidence Analyzing and Interpreting Data Using Mathematics and Computational Thinking	Patterns	LS4.A	(SL.8.1) MATH: (6.SP.B.4)
99 INVESTIGATION: A Whale of A Tale Students investigate anatomical evidence for evolution by comparing whale skeletons.	MS-LS4-1 MS-LS4-2	Engaging in Argument from Evidence	Patterns	LS4.A	
100 INVESTIGATION: DNA: The Evidence Within Students investigate how DNA sequences can provide evidence for evolution. [For Evolution UNIT only: Includes student activity in Teacher’s Guide to be done BEFORE activity]		Engaging in Argument from Evidence			
101 TALKING IT OVER: Birds of a Feather? After reading about the history of the dodo bird and the common pigeon, students discuss the relationship between extinction and evolution.	MS-LS4-5	Engaging in Argument from Evidence		LS4.B	RST.6-8.1; (RST.6-8.2); WHST.6-8.2; (SL.8.1)

ISSUES AND PHYSICAL SCIENCE

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
The Chemistry of Materials					
12 INVESTIGATION: Evaluating Materials Students compare aluminum, glass, and plastic in order to choose the best material for soft drink containers.		Analyzing and Interpreting Data Engaging in Argument from Evidence	(Structure and Function) Interdependence of Science, Engineering, and Technology Cause and Effect Patterns		(RST.6-8.1); RST.6-8.3; WHST.6-8.1 MATH: MP.2; MP.4; (6.SP.B.4)
13 READING: Product Life Cycle Students construct a life cycle diagram after reading about the life cycle of glass, metal, and plastic drink containers.	MS-PS1-3		(Structure and Function) Interdependence of Science, Engineering, and Technology Cause and Effect		RST.6-8.7; RST.6-8.1; (WHST.6-8.8); (WHST.6-8.7); (SL.8.5); (WHST.6-8.9)
14 LABORATORY: Physical and Chemical Properties of Materials Students test and group 6 different materials based on their chemical and physical properties.	MS-PS1-2	Planning and Carrying Out Investigations	(Structure and Function)	PS1.A	RST.6-8.3
15 INVESTIGATION: Families of Elements Students group elements based on chemical and physical properties and then analyze families of elements as historically defined by scientists.		(Developing and Using Models)	Patterns	PS1.A	RST.6-8.3 MATH: MP.2; (6.SP.B.4)
16 READING: Elements and the Periodic Table Students read about elements, their combination in compounds, and the historical development of the Periodic Table.			(Scale, Proportion, and Quantity) Patterns	PS1.A	(RST.6-8.7); RST.6-8.1 MATH: 6.RP.A.3; 6.RP.A.1; 7.RP.A.2

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
The Chemistry of Materials					
17 MODELING: Modeling Molecules Students use models to explore the concepts of element, molecules, and compounds.	MS-PS1-1	Developing and Using Models	Scale, Proportion, and Quantity (Patterns) Energy and Matter (Systems and System Models)	PS1.A	
18 LABORATORY: Properties of Plastics Students explore the properties of four common plastics to determine how these properties affect the common uses of these plastics.		(Planning and Carrying Out Investigations)	(Structure and Function)	PS1.A	RST.6-8.3; (6.SP.B.4)
19 LABORATORY: Creating New Materials Students observe and compare the properties of reactants and a product as they cross-link polyvinyl alcohol with sodium borate to produce a new polymer.	MS-PS1-2	(Analyzing and Interpreting Data)	(Structure and Function)	PS1.A PS1.B	RST.6-8.3
20 MODELING: Modeling Polymers Students study the structure and properties of polymer molecules by making different models of polymers.	MS-PS1-1	Developing and Using Models	Scale, Proportion, and Quantity Patterns (Structure and Function) Cause and Effect (Systems and System Models)	PS1.B	RST.6-8.3; (RST.6-8.7)
21 READING: Polymer Parts Students read about synthetic polymers and the cross-linking process, which changes the chemical structure of a polymer.	(MS-PS1-3)		Scale, Proportion, and Quantity Patterns	PS1.A PS1.B	(RST.6-8.7); RST.6-8.1; RST.6-8.3; RST.6-8.2; WHST.6-8.9

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
The Chemistry of Materials					
			Structure and Function Interdependence of Science, Engineering, and Technology (Influence of Engineering, Technology, and Science on Society and the Natural World)		
22 INVESTIGATION: Environmental Impact of Computers Students consider the material composition of a computer and its environmental impact by constructing a pie chart or graph.		Analyzing and Interpreting Data	(Influence of Engineering, Technology, and Science on Society and the Natural World) Patterns		MATH: MP.2; MP.4; (6.SP.B.4); 6.SP.B.5
23 LABORATORY: Producing Circuit Boards Students simulate the etching of computer circuit boards and then read about their manufacturer and the resulting waste.			(Structure and Function) Interdependence of Science, Engineering, and Technology (Influence of Engineering, Technology, and	PS1.B	RST.6-8.1; RST.6-8.3; RST.6-8.2

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
The Chemistry of Materials					
			Science on Society and the Natural World)		
24 LABORATORY: Diluting the Problem Students explore one method of treating used copper chloride from circuit board production: dilution. They then determine the concentration of copper in the used copper chloride waste solution.		(Planning and Carrying Out Investigations)	(Scale, Proportion, and Quantity)		RST.6-8.3 MATH: MP.2; MP.4; 6.RP.A.3; 6.SP.B.5; (7.EE.B.3); 6.RP.A.1; 7.RP.A.2
25 LABORATORY: Conservation of Mass Students conduct two chemical reactions in closed containers in order to compare mass before and after a chemical reaction has taken place. They compare the change in mass to the same reactions in open containers, and use this data to support the Law of Conservation of Mass.	MS-PS1-2 MS-PS1-5	(Planning and Carrying Out Investigations) Using Mathematics and Computational Thinking	(Scale, Proportion, and Quantity) Energy and Matter	PS1.B	RST.6-8.3 MATH: MP.2; 6.SP.B.5
26 LABORATORY: Incinerating the Waste Simulated metal waste is burned, and students test the resulting smoke and ash for the presence of potential toxic metals.			(Energy and Matter)		RST.6-8.3
27 LABORATORY: Reclaiming the Metal Students investigate the use of three metal replacement reactions to extract copper from the used copper chloride solution.	MS-PS1-2	Planning and Carrying Out Investigations (Engaging in Argument from Evidence)	(Energy and Matter)	PS1.B	RST.6-8.3; (SL.8.5) MATH: MP.2; 6.RP.A.1; 7.RP.A.2
28 LABORATORY: Another Approach to Metal Reclamation Students precipitate copper compounds from used copper chloride and then decide upon a disposal method for the waste copper chloride solution.	MS-PS1-2	(Engaging in Argument from Evidence)		PS1.B	RST.6-8.3; WHST.6-8.1 MATH: MP.2
29 TALKING IT OVER: The Green Computer		(Obtaining,			RST.6-8.1; WHST.6-

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
The Chemistry of Materials					
<p>Decision From four proposals, students recommend a computer purchase based on many factors including the environmental impact of the life cycle of the computer chosen.</p>		<p>Evaluating, and Communicating Information)</p> <p>(Engaging in Argument from Evidence)</p> <p>Using Mathematics and Computational Thinking</p>			<p>8.1; SL.8.5</p> <p>MATH: MP.2; MP.4; (7.EE.B.3)</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Energy					
53 INVESTIGATION: Home Energy Use Students collect data on six human characteristics and discuss causes of human variation.			(Influence of Engineering, Technology, and Science on Society and the Natural World)	PS3.B	MATH: MP.2
54 LABORATORY: Drive a Nail Students explore energy transfer as they drive a nail into a block. The concepts of kinetic and gravitational potential energy are introduced.	(MS-PS3-2) (MS-PS3-5)	Analyzing and Interpreting Data Planning and Carrying Out Investigations (Asking Questions and Defining Problems)	Cause and Effect Energy and Matter	PS3.A PS3.B PS3.C	RST.6-8.3; (RST.6-8.9); 6.SP.B.5 MATH: MP.2
55 ROLE PLAY: Roller Coaster Energy Students further examine energy transfer and the transformation between gravitational potential energy and kinetic energy in the context of roller coasters.	MS-PS3-5		Energy and Matter	PS3.A PS3.B	(RST.6-8.9); WHST.6-8.9 MATH: MP.2
56 INVESTIGATION: Shake the Shot Students add mechanical energy to a system and measure the temperature change that results from the energy transformation.	(MS-PS3-4) (MS-PS3-5)	Analyzing and Interpreting Data Planning and Carrying Out Investigations	Cause and Effect Energy and Matter	PS3.A PS3.B PS3.C	RST.6-8.3 MATH: MP.2; 6.SP.B.5
56A LABORATORY: Motors and Generators Students construct a simple motor from a wire coil, magnets, and batteries. They investigate ways of making the motor spin faster and observe that a magnetic field is produced around a current-carrying wire. Students then use a motor as a generator to light a light-emitting diode	(MS-PS3-5)	Analyzing and Interpreting Data Planning and Carrying Out Investigations	Energy and Matter	PS2.B PS3.A PS3.B PS3.C	RST.6-8.3

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Energy					
(LED).		Asking Questions and Defining Problems			
57 READING: Conservation of Energy Students read about the Law of the Conservation of Energy, the process of heat transfer during transformations and the principle of energy efficiency.		Engaging in Argument from Evidence	(Interdependence of Science, Engineering, and Technology) Cause and Effect	PS3.A	RST.6-8.1; RST.6-8.2; WHST.6-8.9 MATH: MP.2; MP.4
58 INVESTIGATION: Follow the Energy Students identify different energy types as they follow energy movement in every day events.			Energy and Matter	PS3.A PS3.B	RST.6-8.7
59 LABORATORY: Ice Melting Contest Students explore heat transfer by conduction as they design a method for melting an ice cube as quickly as possible.	MS-PS3-3	Constructing Explanations and Designing Solutions	Cause and Effect Structure and Function (Energy and Matter)	PS3.A PS3.B	RST.6-8.3
60 MODELING: Ice-Preserving Contest Students design a container to preserve an ice-cube. They follow this up by reading about ice boxes and refrigeration.	MS-PS3-3	Constructing Explanations and Designing Solutions	Structure and Function (Interdependence of Science, Engineering, and Technology) Cause and Effect (Energy and Matter) (Systems and System Models)	PS3.A PS3.B ETS1.A ETS1.B ETS1.C	RST.6-8.7; (RST.6-8.1); (WHST.6-8.8); RST.6-8.3; (WHST.6-8.7); (WHST.6-8.9)
61 LABORATORY: Mixing Hot and Cool Water	MS-PS3-4	Analyzing and	Energy and Matter	PS3.A	RST.6-8.7; RST.6-8.3

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Energy					
Students mix different temperatures and volumes of water in order to analyze the heat transfer that occurs.		Interpreting Data (Planning and Carrying Out Investigations)	(Scale, Proportion, and Quantity)	PS3.B	MATH: MP.2; MP.4; 6.SP.B.5; 6.NS.C.5; 6.RP.A.1; 7.RP.A.2
62 INVESTIGATION: Quantifying Energy Students measure temperature differences with a calorimeter and calculate the energy transferred from ice to water during melting.	MS-PS3-4	Analyzing and Interpreting Data Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	Energy and Matter (Scale, Proportion, and Quantity)	PS3.A PS3.B	RST.6-8.3 MATH: MP.2; MP.4; (6.EE.A.2)
63 LABORATORY: Measuring Calories Students use a calorimeter to measure the stored energy in a nut. They use the data to calculate the Calories in the nut.	MS-PS3-4	Analyzing and Interpreting Data Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	(Cause and Effect) Energy and Matter (Scale, Proportion, and Quantity)	PS1.B PS3.A PS3.B ETS1.C	RST.6-8.3 MATH: MP.2; MP.4; 6.RP.A.3; 6.SP.B.5; (6.EE.A.2)
64 READING: Electricity Generation Students investigate the sources of electricity in the United States. They read about renewable and non-renewable sources and discuss the trade-offs of different electricity generation methods.		Engaging in Argument from Evidence	(Structure and Function) Interdependence of Science, Engineering, and Technology (Influence of	PS3.B	RST.6-8.1; RST.6-8.2; WHST.6-8.9 MATH: MP.2; MP.4; 6.RP.A.3; 6.SP.B.5; 6.RP.A.1; 7.RP.A.2

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Energy					
			Engineering, Technology, and Science on Society and the Natural World) (Energy and Matter)		
65 LABORATORY: Electrochemical Batteries Students build a wet cell to explore how different metals react to produce electrical energy. A small motor is used to detect the amount of energy the different reactions produce.		Developing and Using Models Analyzing and Interpreting Data (Planning and Carrying Out Investigations) Asking Questions and Defining Problems	(Cause and Effect) (Energy and Matter)		RST.6-8.3; WHST.6-8.9 MATH: 6.NS.C.5
65A LABORATORY: Energy and Magnetic Fields Students investigate magnetic fields using a plotting compass. They also read about some of the properties of fields and electromagnets.	(MS-PS2-5)		Energy and Matter	PS2.B	RST.6-8.3
66 INVESTIGATION: Connecting Circuits Students build simple circuits that transform electrical energy into light, sound, and mechanical energy. They test various materials for conductivity and explore series and parallel circuits.		Analyzing and Interpreting Data Planning and Carrying Out Investigations	(Energy and Matter)		RST.6-8.3 MATH: 6.NS.C.5
67 LABORATORY: Hot Bulbs Students calculate the efficiency of a flashlight bulb in producing light by measuring how much energy is “wasted” as thermal energy.	(MS-PS3-4)	Analyzing and Interpreting Data Planning and	(Cause and Effect) (Energy and Matter)	PS3.A PS3.B	RST.6-8.3 MATH: MP.2; MP.4; 6.RP.A.3; 6.SP.B.5;

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Energy					
		Carrying Out Investigations Using Mathematics and Computational Thinking	Scale, Proportion, and Quantity		(6.EE.A.2); (7.EE.B.3); (7.EE.B.4); 6.RP.A.1; 7.RP.A.2
68 LABORATORY: Photovoltaic Cells Students experiment with photovoltaic cells as they explore the sunlight– electricity energy transformation		Analyzing and Interpreting Data (Planning and Carrying Out Investigations) Asking Questions and Defining Problems	Cause and Effect (Energy and Matter)	PS3.B	RST.6-8.3
69 LABORATORY: Solar Heating Students continue their exploration of solar energy by investigating a model solar heat collector and calculating its efficiency.	(MS-PS3-3)	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	Structure and Function Energy and Matter	PS3.B ETS1.A ETS1.B ETS1.C	RST.6-8.3 MATH: MP.2; (6.SP.B.4); (6.EE.A.2); (7.EE.B.3); (7.EE.B.4); 6.RP.A.1; 7.RP.A.2
70 MODELING: Collecting Solar Energy Students build and compare two boxes; one to absorb as much sunlight as possible and the other one to absorb as little sunlight as possible.	MS-PS3-3	Developing and Using Models Constructing Explanations and	Structure and Function (Energy and Matter)	PS3.A ETS1.A ETS1.C	RST.6-8.3; (WHST.6-8.8); (WHST.6-8.7); (WHST.6-8.9)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Energy					
		Designing Solutions			
71 READING: Household Energy Efficiency Students read about home energy use, ways to improve energy efficiency and methods of conserving energy.		Engaging in Argument from Evidence	Structure and Function Interdependence of Science, Engineering, and Technology	PS3.A PS3.B	(RST.6-8.1); WHST.6-8.1; WHST.6-8.9
72 INVESTIGATION: Improving Household Efficiency Students are presented with fictional scenarios of families who want to reduce their home energy cost. Using their knowledge of energy concepts, they conduct an economic analysis and make energy-saving recommendations that meet the needs of the family.		(Engaging in Argument from Evidence)	Structure and Function (Influence of Engineering, Technology, and Science on Society and the Natural World)	PS3.A PS3.B	RST.6-8.7; (WHST.6-8.8); (WHST.6-8.7); WHST.6-8.1; (WHST.6-8.9) MATH: MP.2; MP.4; (7.EE.B.3); (7.EE.B.4)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Force and Motion					
73 TALKING IT OVER: Choosing a Safe Vehicle Students compare the specifications of two vehicles in order to choose the one they feel is safe.		(Engaging in Argument from Evidence)	(Structure and Function) (Interdependence of Science, Engineering, and Technology)		
74 LABORATORY: Measuring Speed Students use a cart, ramp, and track to calculate speed from distance and time measurements. Then students design an investigation that examines the effect of height of the ramp on the speed of the cart.		Analyzing and Interpreting Data Asking Questions and Defining Problems Planning and Carrying Out Investigations Engaging in Argument from Evidence Using Mathematics and Computational Thinking	Scale, Proportion, and Quantity	PS2.A	RST.6-8.3 MATH: MP.2; MP.4; 6.RP.A.3; 6.SP.B.5; (6.EE.A.2); 6.RP.A.1; (6.RP.A.2); 7.RP.A.2
75 INVESTIGATION: Interpreting Motion Graphs Students construct and interpret distance vs time graphs by matching a narrative to graph segments.		Analyzing and Interpreting Data	Patterns	PS2.A	RST.6-8.7 MATH: MP.2; 6.RP.A.3; (6.SP.B.4); 6.NS.C.5; 6.RP.A.1; (6.RP.A.2); 7.RP.A.2
76 LABORATORY: Speed and Collisions To investigate the effect of vehicle speed on the severity of accidents, students use the ramp and cart to simulate vehicle collisions at different		Analyzing and Interpreting Data (Engaging in	Cause and Effect	PS2.A PS3.C	RST.6-8.3 MATH: MP.2; 6.SP.B.5; 6.RP.A.1; (6.RP.A.2);

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Force and Motion					
speeds.		Argument from Evidence) Planning and Carrying Out Investigations Using Mathematics and Computational Thinking			7.RP.A.2
77 LABORATORY: Mass and Collisions Students design and carry out investigations to discover the effect of mass on the severity of accidents.		Analyzing and Interpreting Data Asking Questions and Defining Problems	Cause and Effect	PS2.A	RST.6-8.3 MATH: MP.2; MP.4; 6.RP.A.3; 6.SP.B.5; 6.RP.A.1; (6.RP.A.2); 7.RP.A.2
78 PROBLEM SOLVING: Force, Acceleration, and Mass Students analyze data and investigate the relationship between force, mass, and acceleration.		Analyzing and Interpreting Data Using Mathematics and Computational Thinking	Cause and Effect Scale, Proportion, and Quantity Patterns	PS2.A	RST.6-8.3; (RST.6-8.9) MATH: MP.2; MP.4; (6.SP.B.4); (6.EE.A.2)
79 LABORATORY: Inertia around a Curve Students first observe a marble moving around a circular track and then predict the path taken by the marble once a section of the track is removed.		Analyzing and Interpreting Data Planning and Carrying Out Investigations	Cause and Effect	PS2.A	RST.6-8.3
80 READING: Laws of Motion Students read about Newton’s discoveries of the fundamental relationships between forces, including Newton’s three laws and friction.			Scale, Proportion, and Quantity	PS2.A	RST.6-8.1; (RST.6-8.9); WHST.6-8.9 MATH: MP.2; MP.4; 6.RP.A.3; (6.EE.A.2); 6.RP.A.1; 7.RP.A.2

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Force and Motion					
81 LABORATORY: The Net Force Challenge Students use force meters to investigate the effect of more than one force on a block.		Analyzing and Interpreting Data Planning and Carrying Out Investigations	Cause and Effect (Stability and Change)	PS2.A	RST.6-8.3; (RST.6-8.9) MATH: MP.2; (MP.4); 6.RP.A.3; 6.NS.C.5; 6.RP.A.1; 7.RP.A.2
82 LABORATORY: Braking Distance To simulate the effect of speed on braking distance, students measure the distance that carts travel after encountering a high friction surface.		Analyzing and Interpreting Data Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	Cause and Effect (Stability and Change) Scale, Proportion, and Quantity	PS2.A	RST.6-8.3 MATH: MP.2; MP.4; 6.SP.B.5
83 INVESTIGATION: Coming to a Stop Students learn about stopping distance and then investigate further by calculating and graphing data for different road and driver conditions.		Engaging in Argument from Evidence Analyzing and Interpreting Data Using Mathematics and Computational Thinking	Cause and Effect (Stability and Change) Patterns	PS2.A	RST.6-8.3 MATH: MP.2; MP.4; (6.SP.B.4); (6.EE.A.2); (7.EE.B.3)
84 READING: Decelerating Safely Students learn about vehicle safety features that decelerate the body more slowly than it would ordinarily experience in an accident.		Engaging in Argument from Evidence	(Interdependence of Science, Engineering, and Technology) (Cause and Effect) (Stability and	PS2.A	RST.6-8.7; RST.6-8.1; RST.6-8.2; WHST.6-8.9 MATH: MP.2; (6.EE.A.2)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Force and Motion					
			Change)		
85 INVESTIGATION: Crash Testing Students design and present the specifications for a crash test dummy. They weigh the advantages and disadvantages of using different sized dummies.	(MS-PS2-1)	Constructing Explanations and Designing Solutions (Engaging in Argument from Evidence)	Structure and Function (Interdependence of Science, Engineering, and Technology) Systems and System Models	ETS1.A ETS1.C	SL.8.5
86 MODELING: Investigating Center of Mass Students compare the stability of carts with different center-of masses as they collide with a stationary barrier.		Analyzing and Interpreting Data Planning and Carrying Out Investigations	Cause and Effect (Stability and Change)		RST.6-8.3 MATH: MP.2
87 INVESTIGATION: Fatal Accidents Students investigate types of car accidents and fatality rates by analyzing actual accident data.		Analyzing and Interpreting Data			MATH: MP.2; 6.SP.B.5
88 ROLE PLAY: Safety for All Students recommend a solution to the problem of increased injuries and damage related to vehicle incompatibility during collisions		(Engaging in Argument from Evidence) Obtaining, Evaluating, and Communicating Information			(RST.6-8.1); WHST.6-8.1

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Waves					
89 INVESTIGATION: It's a Noisy World This activity introduces sound intensity and the decibel scale. Students examine cards that represent the relative intensity of various sounds and learn that an increase of 10 dB is equivalent to a 10-fold increase in sound intensity.		Using Mathematics and Computational Thinking	Scale, Proportion, and Quantity		RST.6-8.3 MATH: MP.2; MP.4; 6.RP.A.3; (8.EE.A.3); 6.RP.A.1; 7.RP.A.2
90 LABORATORY: The Frequency of Sound Students make a pendulum to create a wave in yarn attached to the bottom of the pendulum. By varying the length of the pendulum, students change the frequency of the wave. They measure the wavelength associated with each frequency.	(MS-PS4-1)	Analyzing and Interpreting Data Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	Scale, Proportion, and Quantity Patterns	PS4.A	(RST.6-8.9) MATH: MP.2; MP.4; 6.SP.B.5; (6.EE.A.2); 6.RP.A.1; 7.RP.A.2
91 LABORATORY: Longitudinal and Transverse Waves Using a long metal spring, students investigate transverse and longitudinal waves. They investigate such properties of the waves as wavelength and amplitude.		Planning and Carrying Out Investigations		PS4.A	RST.6-8.3; (RST.6-8.9)
92 INVESTIGATION: Noise-Induced Hearing Loss Students are introduced to the concept of noise-induced hearing loss. They analyze fictitious profiles and develop a list of strategies to reduce the risk of noise-induced hearing loss.			Cause and Effect		MATH: MP.2; MP.4; (6.SP.B.4)
93 READING: The Nature of Waves Students read about the properties of two major kinds of waves, sound and light. The nature of these waves, the role of media in their propagation, and their speed in various media are described.	(MS-PS4-2)		Scale, Proportion, and Quantity (Influence of Engineering, Technology, and Science on Society)	PS4.A PS4.B	RST.6-8.7; RST.6-8.1; (RST.6-8.9); WHST.6-8.9 MATH: MP.2

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Waves					
			and the Natural World)		
94 LABORATORY: Comparing Colors Students explore of light by investigating the colors of the visible spectrum. Students first observe how a diffraction grating splits white light into its component colors. Then they investigate the frequency of the different colors of white light through the use of a phosphorescent material.		Engaging in Argument from Evidence Planning and Carrying Out Investigations		PS4.B	RST.6-8.3 MATH: MP.2; MP.4
95 LABORATORY: Selective Transmission Students learn more about the properties of light by investigating transmission, absorption, and reflection of waves outside the visible spectrum. Students investigate how three thin films, which all transmit visible light, selectively transmit waves that are not visible, such as ultraviolet.	(MS-PS4-2)	Analyzing and Interpreting Data Engaging in Argument from Evidence Planning and Carrying Out Investigations		PS4.B	RST.6-8.3 MATH: MP.2; MP.4; 6.SP.B.5
96 READING: The Electromagnetic Spectrum Students read about the kinds of electromagnetic energies emitted from the sun that are not visible. They refer to their knowledge of frequency, wavelength, and energy levels to learn about the discovery and applications of infrared energy and ultraviolet.			Scale, Proportion, and Quantity Influence of Engineering, Technology, and Science on Society and the Natural World Scale, Proportion, and Quantity (Energy and Matter)	PS4.B	RST.6-8.1; WHST.6-8.9

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Waves					
97 LABORATORY: Reflection and Absorption Students compare the reflection and absorption of sunlight off a dark surface and reflective surface. Then they consider the increased health risks due to sunlight that is reflected onto the skin and eyes from sand, snow, or water.	(MS-PS4-2)	Analyzing and Interpreting Data Planning and Carrying Out Investigations	Cause and Effect	PS4.B	RST.6-8.3 MATH: MP.2; 6.SP.B.5
98 LABORATORY: Blocking Out Ultraviolet Students design an experiment that compares the effects of sunblock lotion and moisturizing lotion for their ability to transmit, reflect or absorb ultraviolet. They relate the results to the sun's effects on human health and actual use of sunscreens.		Analyzing and Interpreting Data Planning and Carrying Out Investigations			RST.6-8.3 MATH: 6.SP.B.5
99 TALKING IT OVER: Personal Protection Plan Students analyze a series of fictitious profiles to determine the relative risk of cataracts and skin cancer for each case. After analyzing these narratives, each student determines his or her own relative exposure risk from ultraviolet, and then creates a personal protection plan.		(Engaging in Argument from Evidence)	Cause and Effect		WHST.6-8.1 MATH: MP.2

ISSUES AND EARTH SCIENCE

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Rocks and Minerals					
12 INVESTIGATION: Observing Natural Resources Students examine and rank four natural resources from most to least valuable.		Analyzing and Interpreting Data Planning and Carrying Out Investigations			
13 LABORATORY: Diamond Dilemma Students gather data on an unidentified mineral that appears to be a diamond.		Analyzing and Interpreting Data Planning and Carrying Out Investigations			
14 PROBLEM SOLVING: Analyzing Diamond Data Students compare data on the unidentified mineral to that of four known materials and then identify the sample as fluorite.		Analyzing and Interpreting Data Planning and Carrying Out Investigations			
15 READING: Mineral Properties A reading on minerals and their properties introduces the idea that rocks are made of minerals.			(Interdependence of Science, Engineering, and Technology) (Influence of Engineering, Technology, and Science on Society and the Natural World)	(ESS3.A)	RST.6-8.1; RST.6-8.7
16 LABORATORY: Mineral Identification Students design an investigation to identify an unknown mineral.		Analyzing and Interpreting Data			

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Rocks and Minerals					
		Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations			
17 LABORATORY : The Minerals in Rocks Students select and test a single property to determine whether the mineral found in two different rock samples is calcite or quartz.		Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations			
18 TALKING IT OVER: Every Rock Tells a Story Students analyze the content of a fictional newspaper story that describes the alleged discovery of diamonds in a national forest.		Analyzing and Interpreting Data (Asking Questions and Defining Problems)			RST.6-8.1
19 READING: Rock Formation The formation of sedimentary, igneous, and metamorphic rocks is explained in the context of coal, kimberlite, and marble formation.	(MS-ESS2-1)		Energy and Matter		RST.6-8.1; WHST.6-8.9
20 LABORATORY : Identifying Rock Types Students observe and identify rocks as igneous, sedimentary, or metamorphic.		Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations			

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Rocks and Minerals					
21 MODELING: Modeling Rock Layers Students model the formation of sedimentary rock layers by dropping plastic chips into a cylinder.	(MS-ESS1-4)	Developing and Using Models Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations	(Systems and System Models) Scale, Proportion, and Quantity	(ESS1.C)	
22 INVESTIGATION: The Rock Cycle Game Students play a game that models the rock cycle.	MS-ESS2-1	Developing and Using Models	Systems and System Models Scale, Proportion, and Quantity (Stability and Change) Energy and Matter	(ESS2.A)	
23 TALKING IT OVER : Making Minerals Students evaluate data on mined vs. manufactured diamonds and discuss their relative values.		(Analyzing and Interpreting Data) (Asking Questions and Defining Problems)	Interdependence of Science, Engineering, and Technology		

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Erosion and Deposition					
24 TALKING IT OVER: Where Should We Build? Students are introduced to a scenario about fictitious Boomtown and consider the impact of construction at three potential building sites.		Analyzing and Interpreting Data	Stability and Change Influence of Engineering, Technology, and Science on Society and the Natural World		
25 INVESTIGATION: Making Topographical Maps Students construct a topographic map of a land formation in Boomtown.					(6.NS.C.5)
26 PROBLEM SOLVING: Boomtown's Topography Students compare topographic maps of Boomtown at the present with those from the past and identify changes in the landforms.		Analyzing and Interpreting Data	Stability and Change Influence of Engineering, Technology, and Science on Society and the Natural World		(6.NS.C.5)
27 PROBLEM SOLVING: Investigating Boomtown's Weather Students construct bar graphs of rainfall data as they consider the impact of rainfall patterns on the three possible construction sites.			Stability and Change Patterns		MATH: MP.2
28 MODELING: Cutting Canyons and Building Deltas Students use a river model to investigate how flowing water creates common landforms, such as rivers and deltas.	MS-ESS2-2	Developing and Using Models Planning and Carrying Out Investigations	Systems and System Models Energy and Matter Cause and Effect	ESS2.C	(RST.6-8.9)
29 READING: Weathering, Erosion, and Deposition	MS-ESS2-2	Constructing Explanations and	Stability and Change	ESS2.C	RST.6-8.1; RST.6-8.7; (RST.6-8.9); WHST.6-

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Erosion and Deposition					
Students read about weathering, erosion, and deposition and about the impact of human activity on these processes.		Designing Solutions	(Interdependence of Science, Engineering, and Technology) Energy and Matter Cause and Effect Influence of Engineering, Technology, and Science on Society and the Natural World		8.9
30 ROLE PLAY: Challenges of the Mississippi Delta Students relate the scenario to the broader issue of land use by learning about erosion and deposition problems along developed areas of the Mississippi.	MS-ESS2-2		Stability and Change Energy and Matter Influence of Engineering, Technology, and Science on Society and the Natural World Patterns Cause and Effect	ESS2.C (ESS3.B)	RST.6-8.1; WHST.6-8.9 MATH: (6.NS.C.5)
31 MODELING: Resistance to Erosion Students investigate the effects of erosion on different earth materials by using models of	MS-ESS2-2	Developing and Using Models		ESS2.C	

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Erosion and Deposition					
different earth materials.		Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations			
32 INVESTIGATION: Modeling Erosion Students model the effect of ocean waves on a cliff and design an investigation using a model to determine the effects of a rock barrier on erosion of the cliff.	MS-ESS2-2	Developing and Using Models Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations	Systems and System Models Influence of Engineering, Technology, and Science on Society and the Natural World	ESS2.C	
33 READING: Earth Processes and Boomtown’s Coast Students read about the effect of earth processes on coastal systems and the efforts to mitigate the impact of human activity.	MS-ESS2-2	Constructing Explanations and Designing Solutions	Stability and Change Influence of Engineering, Technology, and Science on Society and the Natural World	ESS2.C (ESS3.B)	RST.6-8.7
34 PROJECT: Preparing the Geologist’s Report Students use the information they have gathered			Influence of Engineering,	(ESS2.C)	WHST.6-8.2

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Erosion and Deposition					
throughout the unit to summarize the geology at each of the building sites in Boomtown.			Technology, and Science on Society and the Natural World		
35 ROLE PLAY: Building in Boomtown Students present a building plan for one of the sites and then make their final decision about where Boomtown should build homes.		Engaging in Argument from Evidence	Influence of Engineering, Technology, and Science on Society and the Natural World	(ESS2.C)	(SL.8.5); WHST.6-8.1

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Plate Tectonics					
36 TALKING IT OVER : Storing Nuclear Waste Earthquakes and volcanoes are introduced as students analyze evidence related to the storing of nuclear waste at Yucca Mountain, Nevada.		(Analyzing and Interpreting Data) Engaging in Argument from Evidence (Asking Questions and Defining Problems)	(Influence of Engineering, Technology, and Science on Society and the Natural World)	(ESS3.B)	RST.6-8.1; WHST.6-8.1
37 MODELING: Volcanic Landforms Students consider the constructive nature of volcanoes as they model the effects of two different kinds of volcanic eruptions.	MS-ESS2-2	Developing and Using Models Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations	(Systems and System Models)		(RST.6-8.9)
38 READING: Beneath the Earth's Surface Students construct diagrams describing earth's interior before and after they read about volcanoes and earth layers.	MS-ESS2-1 MS-ESS2-2	Developing and Using Models	Stability and Change Energy and Matter	(ESS2.A)	RST.6-8.7; (RST.6-8.9); (WHST.6-8.9) MATH: (7.RP.A.2)
39 INVESTIGATION: Earth Time Students are introduced to the age of earth as they place important events in earth's history into one of four time periods.	MS-ESS1-4 MS-ESS2-2	Constructing Explanations and Designing Solutions Developing and Using Models		(ESS1.C)	WHST.6-8.1 MATH: (7.RP.A.2)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Plate Tectonics					
		Engaging in Argument from Evidence			
40 INVESTIGATION: The Continent Puzzle Students use puzzle pieces representing earth's continents to begin to investigate continental drift.	MS-ESS2-2 MS-ESS2-3	Developing and Using Models	(Systems and System Models) Stability and Change Scale, Proportion, and Quantity	ESS2.B	(RST.6-8.9)
41 TALKING IT OVER: Continental Drift Students consider the historical development of the idea of continental drift as they evaluate evidence about the movement of continents.	MS-ESS2-2	(Analyzing and Interpreting Data) (Asking Questions and Defining Problems)	Scale, Proportion, and Quantity Stability and Change	ESS2.B	WHST.6-8.2; (RST.6-8.9)
42 VIEW AND REFLECT: The Theory of Plate Tectonics Students watch a short video on the history of the development of the theory of plate tectonics, beginning with Wegener's idea of continental drift.	MS-ESS2-2	Constructing Explanations and Designing Solutions	Scale, Proportion, and Quantity Energy and Matter Stability and Change	(HS.ESS1.C) ESS2.B	(RST.6-8.9)
43 MODELING: Measuring Earthquakes Students model how a seismograph records earthquakes as they explore the relationship between earthquakes and plate boundaries.				(ESS2.B) (ESS3.C)	
44 PROBLEM SOLVING: Mapping Plates Students compare the sizes and shapes of continents to plates as they label major plates and use earthquake and volcano data to plot and draw missing plate boundaries.	MS-ESS2-2	Constructing Explanations and Designing Solutions Developing and Using Models	Patterns (Systems and System Models) Scale, Proportion,	(ESS3.B)	

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Plate Tectonics					
			and Quantity		
45 READING: Understanding Plate Boundaries Students read about how plate tectonics helps explain earth quakes, volcanoes, and mountain ranges.	MS-ESS2-2	Constructing Explanations and Designing Solutions	Energy and Matter Cause and Effect Stability and Change	(HS.ESS1.C) (ESS2.B) (ESS3.B)	RST.6-8.1; RST.6-8.7; WHST.6-8.9
46 MODELING: Convection Currents Students explore the mechanism behind plate motion as they investigate convection currents.	MS-ESS2-1 MS-ESS2-2	Developing and Using Models Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations	Systems and System Models Scale, Proportion, and Quantity Energy and Matter	(ESS2.A)	
47 COMPUTER SIMULATION: Spreading Plates Students use a computer simulation to investigate what happens when earth's plates move apart over different periods of time.	MS-ESS2-2	Developing and Using Models Planning and Carrying Out Investigations	Systems and System Models Scale, Proportion, and Quantity Energy and Matter Stability and Change Cause and Effect	(HS.ESS1.C) (ESS2.B)	
48 COMPUTER SIMULATION: Other Types of Plate Motion	MS-ESS2-2	Developing and Using Models	Systems and System Models	(HS.ESS1.C) (ESS2.B)	

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Plate Tectonics					
Students use a computer simulation to investigate what happens when earth's plates collide as well as slide past each other.		Analyzing and Interpreting Data	Scale, Proportion, and Quantity Stability and Change Energy and Matter		
49 TALKING IT OVER: Comparing Site Risk Students draw on their knowledge of the risk of earthquakes and volcanoes to compare storing nuclear waste at eight possible sites.		(Analyzing and Interpreting Data) Engaging in Argument from Evidence (Asking Questions and Defining Problems)	(Influence of Engineering, Technology, and Science on Society and the Natural World)	(ESS3.B)	(SL.8.5); WHST.6-8.1

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Weather and Atmosphere					
50 TALKING IT OVER : Weather Effects A fictional story focuses on how weather affects people’s plans and activities. Students are introduced to four kinds of careers related to the science of weather. They then examine maps that show the relative level of risk of different weather disasters.	MS-ESS2-6				
51 COMPUTER INVESTIGATION: Investigating Local Weather Students record and analyze five days of daily weather data. They then record and graph local monthly weather averages. They compare daily weather conditions to the monthly weather data.		Planning and Carrying Out Investigations Analyzing and Interpreting Data	Patterns	(ESS2.C)	MATH: MP.2; (6.NS.C.5)
52 PROJECT: Local Weather History Students design and conduct a survey to learn about the history of weather disasters in the local area, and then compare the level of risk indicated by risk maps to local weather history.		Analyzing and Interpreting Data		(ESS2.C)	WHST:6-8.7 MATH: MP.2
53 PROBLEM SOLVING: Weather and Climate Students examine a climate map along with photos and descriptions of different climates. They identify their local climate as well as the climate for three different regions based on the climate graphs.	MS-ESS2-6	Constructing Explanations and Designing Solutions Analyzing and Interpreting Data	Patterns	ESS2.C (ESS3.C)	MATH: (MP.4); MP.2; 6.NS.C.5
54 PROBLEM SOLVING: The Earth’s Surface Students use a gridded world map to estimate the amounts of earth’s surface covered by water and land. As a class, they calculate the mean, median, and mode of their estimates to help determine an “accepted value” for the class.	MS-ESS2-6	Constructing Explanations and Designing Solutions Analyzing and Interpreting Data Planning and Carrying Out Investigations		(ESS2.C) (ESS2.D)	MATH: MP.2; (6.RP.A.1); (7.RP.A.2)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Weather and Atmosphere					
55 LABORATORY : Heating Earth Surfaces Students design an experiment to measure how the sun’s energy heats land and water, as well as how quickly both of those substances cool. An Anticipation Guide reinforces the idea that differences in heating and cooling of land and water are important factors in determining climate.	MS-ESS2-6	Developing and Using Models Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations	Systems and System Models	(ESS2.C) (ESS2.D) (ESS3.C)	MATH: MP.2; 6.NS.C.5
56 PROBLEM SOLVING: Ocean Temperatures Students investigate the range of mean ocean surface temperatures around the globe. They map and discuss patterns of surface temperatures in particular regions of the oceans. The members of each small group then merge their findings and summarize global patterns.	MS-ESS2-6	Planning and Carrying Out Investigations Analyzing and Interpreting Data	Systems and System Models Energy and Matter Patterns	ESS2.C ESS2.D	MATH: (MP.4); MP.2
57 ROLE PLAY: Oceans and Climate Students learn more about how oceans affect climate. They participate in a role-play that discusses the history of the identification of the Gulf Stream and how modern technology is used to gather ocean data.	MS-ESS2-6		(Interdependence of Science, Engineering, and Technology) Energy and Matter Cause and Effect	ESS2.C ESS2.D	RST.6-8.7; WHST.6-8.9
58 READING: The Causes of Climate Students read about more factors affecting climate, including the sun’s energy. A literacy strategy helps students comprehend the ideas presented in the text.	MS-ESS2-6	Constructing Explanations and Designing Solutions	Energy and Matter Cause and Effect	ESS2.C ESS2.D	RST.6-8.1; RST.6-8.7; WHST.6-8.9
59 LABORATORY : Water as a Solvent Students compare the solubility of solids in three different solvents. The concept of water as the universal solvent is introduced, which helps	MS-ESS2-4	Constructing Explanations and Designing Solutions		(ESS2.C)	

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Weather and Atmosphere					
students grasp the idea that most of the water on earth contains dissolved salts.		Planning and Carrying Out Investigations			
60 READING: Changing States of Water Students are introduced to the different forms of water and how they change from one to another. Teacher model changes in states of water, including demonstrations of evaporation and condensation. The class discusses the relationship between the changing states of water and the water cycle.	MS-ESS2-4	Constructing Explanations and Designing Solutions	Energy and Matter	ESS2.C	RST.6-8.1; RST.6-8.7; WHST.6-8.9
61 LABORATORY: Investigating Groundwater Students investigate the ability of water to filter through gravel and sand. The concept of groundwater is introduced.	MS-ESS2-4	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations	(Systems and System Models)	ESS2.C	
62 MODELING: Traveling on the Water Cycle Students simulate traveling with water molecules through the water cycle. After first choosing a starting point in the water cycle, students roll a number cube to determine where the water will go next. After making at least six stops, students write a story that describes traveling with their water.	MS-ESS2-4		Systems and System Models Scale, Proportion, and Quantity Energy and Matter (Influence of Engineering, Technology, and Science on Society and the Natural	ESS2.C	(WHST.6-8.2)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Weather and Atmosphere					
			World)		
63 LABORATORY: Investigating Air Students explore the nature of air by making on air pressure and on the interaction of air and a chemical indicator. This gives them direct evidence that, although air can be invisible in their everyday experience, it is made up of gases that have distinct properties.		Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations		(ESS2.C)	
64 COMPUTER SIMULATION: Earth’s Atmosphere Students use a computer simulation to sample air composition, temperature, and pressure at different altitudes above earth’s surface. They take three samples within each atmospheric layer and calculate the average values. They then compare the properties of the different atmospheric layers.	MS-ESS2-5	Analyzing and Interpreting Data		(ESS2.C)	MATH: (6.RP.A.1); (7.RP.A.2)
65 INVESTIGATION: History of Earth’s Atmosphere Students place in chronological order eight cards describing the history of earth’s atmosphere. With these cards they examine the relative amounts of carbon dioxide and oxygen gases at different times in earth’s history, and the role of living organisms in determining the composition of the atmosphere.		Analyzing and Interpreting Data Constructing Explanations and Designing Solutions	Scale, Proportion, and Quantity Stability and Change	(ESS2.C) (ESS3.D)	MATH: (6.RP.A.1); (7.RP.A.2)
66 READING: Atmosphere and Climate Students read about the relationship between earth’s atmosphere and its weather and climate. A literacy strategy helps them comprehend the ideas presented in the text.	MS-ESS2-5		Energy and Matter Stability and Change	ESS2.C ESS2.D (ESS3.D)	WHST.6-8.2; RST.6-8.1; WHST.6-8.9
67 LABORATORY: Measuring Wind Speed and Direction Students are introduced to the Beaufort wind scale and its development. They work in groups to design, build, and test instruments for measuring	MS-ESS2-5	Analyzing and Interpreting Data Planning and Carrying Out	(Interdependence of Science, Engineering, and Technology)		

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Weather and Atmosphere					
wind speed and direction. After improving their instruments, they use them to collect wind data.		Investigations Constructing Explanations and Designing Solutions			
68 COMPUTER SIMULATION: Worldwide Wind Students use a computer simulation to identify the most common wind direction in a particular location. They share their data with the class and construct a map of global wind patterns.	MS-ESS2-5	Analyzing and Interpreting Data Planning and Carrying Out Investigations	Systems and System Models Patterns Energy and Matter	ESS2.C	
69 INVESTIGATION: Forecasting Weather Students work together to interpret a weather map and construct a weather report. Each group then presents a weather report to the class. Students use this information to forecast the next day's weather.	MS-ESS2-5		Systems and System Models Interdependence of Science, Engineering, and Technology Cause and Effect Stability and Change Patterns	ESS2.D	
70 TALKING IT OVER: People and Weather Students analyze reports from a hydrologist, climatologist, atmospheric scientist, and meteorologist about the fictional town of Sunbeam City. They consider what role people play in affecting a region's weather and atmosphere.		Analyzing and Interpreting Data Engaging in Argument from Evidence (Asking Questions and Defining	Influence of Engineering, Technology, and Science on Society and the Natural World Patterns	ESS2.D	(SL.8.5); RST.6-8.1; RST.6-8.7; WHST.6-8.1 MATH: MP.2

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Weather and Atmosphere					
		Problems)	Stability and Change		

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Earth in Space					
71 TALKING IT OVER: Sunlight and Shadows Students read about, and propose explanations for, the changing positions of the shadow from a tree over a day. They also critique a fictional student's notebook.		Constructing Explanations and Designing Solutions	Systems and System Models Cause and Effect Patterns	(ESS1.A) (ESS1.B)	
72 INVESTIGATION: Measuring Shadows, Measuring Time Students design an investigation to observe changing shadows during the day. As an extension, they observe the shadows over several weeks.	MS-ESS1-1	Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations	Patterns Systems and System Models Cause and Effect	(ESS1.B)	
73 MODELING: A Day on Earth Students propose an explanation for night and day and view a model of Earth's rotation.	MS-ESS1-1		Cause and Effect Systems and System Models	(ESS1.A) (ESS1.B)	
74 READING: As Earth Rotates Students complete a reading about Earth's rotation, day–night cycle, and time.	MS-ESS1-1		Systems and System Models Cause and Effect Interdependence of Science, Engineering, and Technology	ESS1.A (ESS1.B)	RST.6-8.7; (RST.6-8.9)
75 INVESTIGATION: Sunlight and Seasons Students graph data on the length of daylight and highest angle of the Sun for the 21st of each month and correlate changes in the Sun's position and day length with the seasons.	MS-ESS1-1	Analyzing and Interpreting Data	Patterns Systems and System Models Cause and Effect	(ESS1.A) ESS1.B	(RST.6-8.9) MATH: MP.4; MP.2
76 COMPUTER SIMULATION: A Year Seen From Space	MS-ESS1-1	Developing and Using Models	Patterns	ESS1.A ESS1.B	(RST.6-8.9)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Earth in Space					
Students use observations of Earth’s position relative to the Sun over a year to develop an explanation of the basis for Earth’s year and seasons.		Constructing Explanations and Designing Solutions	Systems and System Models Scale, Proportion, and Quantity Cause and Effect		
77 MODELING: Explaining the Seasons Students explore the effects of direct and indirect sunlight on the solar energy striking Earth’s surface. They learn that the directness of the Sun’s rays is one of two factors that result in hotter summers.	MS-ESS1-1	Constructing Explanations and Designing Solutions	Systems and System Models Cause and Effect	(ESS1.A) ESS1.B	(RST.6-8.9)
78 READING: The Earth on the Move Students read about Earth’s tilt and its effects on the light hitting Earth and on seasons.	MS-ESS1-1	Developing and Using Models	Systems and System Models Cause and Effect	ESS1.A ESS1.B	RST.6-8.7; (RST.6-8.9); WHST.6-8.9
79 FIELD STUDY: The Predictable Moon Students predict the phase of the Moon based on the lunar cycle	MS-ESS1-1	Analyzing and Interpreting Data Planning and Carrying Out Investigations	Patterns Systems and System Models Cause and Effect	(ESS1.A) (ESS1.B)	
80 MODELING: Explaining the Phases of the Moon Students investigate physical models of the phases of the Moon.	MS-ESS1-1	Developing and Using Models	Systems and System Models Patterns Cause and Effect	ESS1.A (ESS1.B)	MATH: (6.RP.A.1)
81 COMPUTER SIMULATION: Moon Phase Simulator Students investigate a computer simulation of the Moon’s phases and connect it to the previous activities.	MS-ESS1-1	Developing and Using Models	Systems and System Models Scale, Proportion, and Quantity	ESS1.A (ESS1.B)	

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Earth in Space					
			Cause and Effect		
82 INVESTIGATION: Tides and the Moon Students analyze the relationship between the Moon's phase and the occurrence of extreme tides.			Patterns Systems and System Models Cause and Effect	(ESS1.A)	MATH: MP.4; MP.2
83 TALKING IT OVER: Marking Time Students decide on the best calendar for different locations based on each community's needs in relation to the solar year and lunar cycle.		(Engaging in Argument from Evidence)			(WHST.6-8.2)
84 INVESTIGATION: Planets in Motion Students model and present the day length, year length, seasons, and tides of eight fictional planets.		Analyzing and Interpreting Data	Scale, Proportion, and Quantity	(ESS1.A)	(SL.8.5) MATH: (6.RP.A.1); (7.RP.A.2); 6.NS.C.5

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Exploring Space					
85 INVESTIGATION: History of Space Exploration Students are introduced to the history of space exploration and share their knowledge of the solar system.			Patterns Influence of Engineering, Technology, and Science on Society and the Natural World		
86 INVESTIGATION: Observing Objects in Space Students observe photographs to help identify planets and stars. They are encouraged to make their own observations outside.				(ESS1.A)	
87 READING: Telescope Technology Students read about the development of the modern telescope. The work of famous astronomers Galileo, Hale, Leavitt, and Hubble are highlighted.			Influence of Engineering, Technology, and Science on Society and the Natural World		RST.6-8.1
88 INVESTIGATION: Classifying Space Objects Students learn to identify and classify celestial bodies based on their characteristics.		Constructing Explanations and Designing Solutions Engaging in Argument from Evidence		(ESS1.A) ESS1.B	WHST.6-8.1
89 INVESTIGATION: Where in the Solar System Am I? Students use descriptions of planets' characteristic to identify four different planets presented in a science-fiction scenario.				(ESS1.A) (ESS1.B)	(WHST.6-8.2) MATH: 6.NS.C.5
90 MODELING: Drawing the Solar System Students use a scale to make an accurate drawing of distances to the planets. They investigate the problem of using the same scale when drawing	MS-ESS1-3	Developing and Using Models Analyzing and	Scale, Proportion, and Quantity Systems and	(ESS1.A) ESS1.B	MATH: (MP.4); (6.RP.A.1); (7.RP.A.2); MP.2

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Exploring Space					
the distance to and diameter of the planets.		Interpreting Data	System Models		
91 PROJECT: How Big Are the Planets? Students determine a scale for modeling the size of the planets and then make a physical model that compares the planets.	MS-ESS1-3	Developing and Using Models Analyzing and Interpreting Data Constructing Explanations and Designing Solutions	Scale, Proportion, and Quantity Systems and System Models	ESS1.B	MATH: (MP.4); (6.RP.A.1); (7.RP.A.2); MP.2
92 READING: The Nearest Star: the Sun Students read about characteristics of the Sun such as its size, distance, composition, and its place as a star in the solar system.		Engaging in Argument from Evidence		(ESS1.A) ESS1.B	RST.6-8.1; RST.6-8.7; WHST.6-8.9; WHST.6-8.1
93 LABORATORY : Picturing Without Seeing Students use measuring probes to make a remote sensing image of an unseen planetary surface. This measuring-and mapping technique is then related to applications in space science.		Developing and Using Models Planning and Carrying Out Investigations	Systems and System Models		MATH: (6.RP.A.1); (7.RP.A.2); MP.2
94 INVESTIGATION: Remote Sensing Students apply knowledge of remote sensing and planetary characteristics to observing and comparing remote sensing images of the surface technology of three planets.		Analyzing and Interpreting Data	Interdependence of Science, Engineering, and Technology		
95 INVESTIGATION: Universal Gravitation Students analyze data of gravitational pull between space objects. Mass and distance are related to the force of gravity.	(MS-ESS1-2)	Constructing Explanations and Designing Solutions Engaging in Argument from Evidence	Systems and System Models Patterns Cause and Effect	ESS1.B	WHST.6-8.1 MATH: MP.2
96 READING: The Effects of Gravity Students read a summary about universal	(MS-ESS1-2)	Constructing Explanations and	Systems and System Models	ESS1.B	RST.6-8.1

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Exploring Space					
gravitation and are introduced to how gravity is related to weight, weightlessness, and orbiting objects.		Designing Solutions	Cause and Effect		MATH: MP.2
97 ROLE PLAY: Exploring Outer Space Students participate in a role-play that discusses the advantages and disadvantages of piloted and unpiloted space missions.			(Interdependence of Science, Engineering, and Technology)		
98 TALKING IT OVER: Choosing a Mission Students consider the benefits and trade-offs of four different space exploration proposals and make a recommendation of which one to fund.		(Analyzing and Interpreting Data) (Asking Questions and Defining Problems)			(SL.8.5)

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Waves NGSS edition					
<p>Performance Expectation MS-PS4-1: Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.</p> <p>Performance Expectation MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.</p> <p>Performance Expectation MS-PS4-3: Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.</p>					
<p>1 INVESTIGATION It's a Noisy World Students are introduced to the physical properties of waves with a scenario that engages them in the properties of sound within the context of hearing loss. Students use mathematical representations to analyze data and identify patterns in sound intensity.</p>	Working towards MS-PS4-1	<p>Using Mathematics and Computational Thinking</p> <p>Analyzing and Interpreting Data</p>	Patterns	MS-PS4.A.1	<p>Math: MP.2, MP.4, 6.RP.A.1, 7.RP.A.2</p> <p>ELA/Literacy: RST.6-8.3</p>
<p>2 INVESTIGATION: Making Sound Waves Students experiment with producing noises of varied intensity and frequency as they begin to build an understanding of the properties of sound. Students then create a model of a sound wave using a metal spring.</p>	Working towards MS-PS4-1	<p>Developing and Using Models</p>	<p>Structure and Function</p> <p>Patterns</p>	MS-PS4.A.1	<p>Math: MP.2</p> <p>ELA/Literacy: RST.6-8.3</p>
<p>3 READING The Nature of Sound Students learn more about longitudinal waves as they obtain, evaluate, and communicate information from text, diagrams, and graphs. Students engage with the crosscutting concept of structure and function as they read about the hearing process and the anatomy of the ear.</p>	<p>Working towards MS-PS4-1</p> <p>Working towards MS-PS4-2</p>	<p>Obtaining, Evaluating, and Communicating Information</p> <p>Analyzing and Interpreting Data</p> <p>Using Mathematics and Computational Thinking</p>	<p>Structure and Function</p> <p>Patterns</p> <p>Connections to Engineering, Technology, and Applications of Science</p>	MS-PS4.A.1 MS-PS4.A.2	<p>Math: MP.2</p> <p>ELA/Literacy: RST.6-8.1 RST.6-8.9</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Waves NGSS edition					
4 INVESTIGATION: Noise-Induced Hearing Loss Students use mathematics and computational thinking as they analyze and interpret data related to the risk of noise-induced hearing loss. Students read the profiles of several individuals and evaluate the risk of noise-induced hearing loss for each one. Students examine the structure and function of the protection provided by two kinds of ear protection.	Working towards MS-PS4-2	Using Mathematics and Computational Thinking Analyzing and Interpreting Data Obtaining, Evaluating, and Communicating Information	Structure and Function	MS-PS4.A.1	Math: MP.4
5 INVESTIGATION: Telephone Model Students model how noise interference affects the transmission and reception of analog and digital signals. They find that the structure of digitized signals, sent as wave pulses, function as a more reliable way to encode and transmit information.	Working towards MS-PS4-3	Developing and Using Models Obtaining, Evaluating, and Communicating Information	Structure and Function Connections to Engineering, Technology, and Applications of Science	MS-PS4.C.1	ELA/Literacy: RST.6-8.3 WHST.6-8.9
6 READING Analog and Digital Technology Students clarify the findings of the previous activity by integrating those results with information in written text. Students explore the history of the development of hearing aids as an example of how technology influences the progress of science and how science has influenced advances in technology.	MS-PS4-3 assessment	Obtaining, Evaluating, and Communicating Information	Structure and Function Connections to the Nature of Science Connections to Engineering, Technology, and Applications of Science	MS-PS4.C.1	ELA/Literacy: RST.6-8.1 RST.6-8.9 WHST.6-8.9

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Waves NGSS edition					
<p>7 INVESTIGATION Another Kind of Wave Students use a model to identify patterns to deduce the inverse relationship between frequency and wavelength, and the direct relationship between amplitude and energy. Students perform calculations and make conceptual connections to make an explanation of the relationships found.</p>	MS-PS4-1 assessment	<p>Developing and Using Models</p> <p>Using Mathematics and Computational Thinking</p> <p>Planning and Carrying Out Investigations</p> <p>Connections to the Nature of Science</p> <p>Analyzing and Interpreting Data</p>	Patterns	MS-PS4.A.1	<p>Math: MP.4</p> <p>ELA/Literacy: RST.6-8.3</p>
<p>8 LABORATORY Wave Reflection Students investigate the reflection of sound and light waves. Building on observations of the relationship between the direction of incident and reflected sound waves, students analyze collected data and deduce the law of reflection as applied to light waves. They model the law as they create ray diagrams to represent both regular and diffuse reflection.</p>	Working towards MS-PS4-2	<p>Developing and Using Models</p> <p>Planning and Carrying Out Investigations</p> <p>Analyzing and Interpreting Data</p> <p>Using Mathematics and Computational Thinking</p> <p>Connections to the Nature of Science</p>	<p>Patterns</p> <p>Structure and Function</p>	MS-PS4.B.1 MS-PS4.B.2	ELA/Literacy: RST.6-8.3

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Waves NGSS edition					
9 LABORATORY: Refraction of Light Students experiment with the transmission of light rays by planning and carrying out an investigation of the refraction of light through water. Looking for patterns in their data, students search for a qualitative relationship between the angle of incidence, angle of refraction, and total internal reflection.	Working towards MS-PS4-2	Developing and Using Models Planning and Carrying Out Investigations Analyzing and Interpreting Data Connections to the Nature of Science	Patterns Structure and Function	MS-PS4.B.2 MS-PS4.B.1	ELA/Literacy: RST.6-8.3
10 LABORATORY Comparing Colors Students collect evidence that indicates that different colors of light carry different amounts of energy. Students analyzing and interpret light transmission graphs for three different sunglass lenses. They determine which sunglass lens (structure) provides the best protection (function) for the eyes.	Working towards MS-PS4-2	Planning and Carrying Out Investigations	Structure and Function	MS-PS4.B.1 MS-PS4.B.3	ELA/Literacy: RST.6-8.3
11 LABORATORY Selective Transmission Students conduct an investigation to test how different films affect the transmission and absorption of light. As they analyze and interpret the data they have collected, they learn that invisible waves are present at both ends of the visible spectrum. Students select and justify which structural films would be most functional to use on windows in three different situations.	Working towards MS-PS4-2	Planning and Carrying Out Investigations Analyzing and Interpreting Data	Structure and Function	MS-PS4.B.1	Math: MP.2 ELA/Literacy: RST.6-8.3

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Waves NGSS edition					
12 READING The Electromagnetic Spectrum Students complete a reading that integrates textual and visual information that extends their understanding of the electromagnetic spectrum. Through the examples of classic experiments, students see that scientific knowledge is based on logical and conceptual connections between evidence and explanations. While reading about applications of electromagnetic energy, students are shown how technologies extend the capabilities of scientific investigation.	Working towards MS-PS4-2	Obtaining, Evaluating, and Communicating Information Connections to the Nature of Science (empirical evidence) Connections to the Nature of Science (new evidence)	Connections to Engineering, Technology, and Applications of Science	MS-PS4.A.2 MS-PS4.B.1 MS-PS4.B.3 MS-PS4.B.4	ELA/Literacy: RST.6-8.1 RST.6-8.9
13 LABORATORY Where Does the Light Go? Students conduct an investigation of the behavior of ultraviolet and infrared on different surfaces. Students analyze and interpret patterns in their data and then use the model in the activity to explain how structures can be designed to minimize or maximize reflection or absorption. Students are formally assessed on Performance Expectation MS-PS4-2.	MS-PS4-2 assessment	Developing and Using Models Planning and Carrying Out Investigations Analyzing and Interpreting Data	Structure and Function Patterns	MS-PS4.B.1	ELA/Literacy: RST.6-8.3
14 LABORATORY Blocking Out Ultraviolet Students apply the concepts of transmission, reflection, and absorption of ultraviolet while planning and carrying out an investigation. Students use models to compare the effectiveness of sunscreen and moisturizing lotion in blocking ultraviolet.		Planning and Carrying Out Investigations Analyzing and Interpreting Data Connections to the Nature of Science Developing and Using Models	Structure and Function	MS-PS4.B.1	ELA/Literacy: RST.6-8.3

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Waves NGSS edition					
<p>15 TALKING IT OVER Personal Protection Plan</p> <p>Students integrate scientific and technical information in a table with written text to evaluate the relative risk of developing cataracts and skin cancer for several individual profiles. Students create connections between scientific knowledge and society by having students consider how the consequences of actions relate to exposure to ultraviolet.</p>		<p>Obtaining, Evaluating, and Communicating Information</p>	<p>Connections to the Nature of Science</p>	<p>MS-PS4.B.1</p>	<p>ELA/Literacy: RST.6-8.9 WHST.6-8.9</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology NGSS edition					
<p>Performance Expectation MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.</p>					
<p>Performance Expectation MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.</p>					
<p>Performance Expectation MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.</p>					
<p>Performance Expectation MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.</p>					
<p>Performance Expectation MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.</p>					
<p>1. TALKING IT OVER The Miracle Fish? This activity introduces students to the concept of ecology—the study of organisms and their interactions with other organisms and the environment — through a reading about the introduction of Nile perch into Lake Victoria in Africa. Students consider how this change to the biological component of the ecosystem has affected populations of other species of fish. After obtaining empirical evidence about past changes in the ecosystem, students construct arguments to predict what will happen in the future. Students then examine trade-offs and decide whether humans should have introduced Nile perch into Lake Victoria—a decision that is informed but not prescribed by science. This activity provides an opportunity to assess student work related to the crosscutting concept of connections to nature of science: Science addresses questions about the natural and material world, but while scientific knowledge can describe the consequences of actions, it does not necessarily prescribe the decisions that society takes.</p>	<p>Working towards MS-LS2-4</p>	<p>Engaging in Argument from Evidence</p>	<p>Cause and Effect Stability and Change Connections to Nature of Science: Science Addresses Questions About the Natural and Material World</p>	<p>MS-LS2.A MS-LS2.C MS-LS4.D</p>	<p>Math: 6.EE.C.9 ELA/Literacy: RST.6-8.1 WHST.6-8.1 WHST.6-8.9</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology NGSS edition					
<p>2 PROJECT Introduced Species Students obtain information about a number of introduced species and use their growing knowledge and understanding about ecology to investigate the effects of one of these introduced species on an ecosystem. When communicating the results of their investigation, they explain how this species interacts with other species in the ecosystem, and how this introduced species affects (or could affect) the flow of energy in the ecosystem.</p>	Working towards MS-LS2-4, MS-LS2-2, MS-LS2-5	<p>Obtaining, Evaluating, and Communicating Information</p> <p>Constructing Explanations</p>	<p>Cause and Effect</p> <p>Stability and Change</p> <p>Connections to Nature of Science: Science Addresses Questions About the Natural and Material World</p>	MS-LS2.A MS-LS2.C MS.LS4.D MS-ETS1.B	<p>ELA/Literacy: RST 6-8.1 RST 6-8.8 WHST 6-8.9 SL8.4 SL8.5</p>
<p>3 INVESTIGATION Data Transects In this activity, students engage in the practice of analyzing and interpreting data to look for patterns among living and nonliving components in ecosystems, and they hypothesize what might be causing those patterns. They explore how ecologists use the transect method to collect ecological data, which gives them an opportunity to become familiar with the nature of science concept that scientific disciplines share common rules of obtaining and evaluating empirical evidence. Students also explore the core idea of populations of organisms being dependent on their environmental interactions both with other living things and with nonliving factors.</p>	Working towards MS-LS2-4	<p>Analyzing and Interpreting Data</p> <p>Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence</p>	<p>Patterns</p> <p>Cause and Effect</p>	MS-LS2.C MS-LS4.D MS-ETS1.B	<p>Math: 6.SP.B.5</p> <p>ELA/Literacy: RST.6-8.3</p>
<p>4 FIELD STUDY Taking a Look Outside Students explore patterns and relationships in their local environment by planning and carrying out an investigation using the transect method learned in the previous activity. Students must decide how to organize their data to allow them to look for patterns among biotic and abiotic</p>	Working towards MS-LS2-4, MS-LS2-5	<p>Planning and Carrying Out Investigations</p> <p>Analyzing and Interpreting Data</p>	<p>Patterns</p> <p>Cause and Effect</p>	MS-LS2.C MS-LS4.D	<p>Math: 6.SP.B.5</p> <p>ELA/Literacy: RST.6-8.3</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology NGSS edition					
components in the ecosystem. Students are encouraged to ask scientific questions about their local ecosystem and determine how they would test these questions.		Asking Questions Connections to Nature of Science: Science Knowledge Is Based on Empirical Evidence			
5 LABORATORY A Suitable Habitat Students plan and conduct an investigation to explore a species' habitat requirements by looking at how individuals respond to and interact with different physical components in the environment. Students construct an argument from evidence for the habitat requirements of the species and where it is likely to be in nature. They explore the behaviors and structures of individuals that help those organisms survive in their environment.	Working towards MS-LS2-1, MS-LS2-4	Planning and Carrying Out Investigations Engaging in Argument from Evidence Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence	Patterns Cause and Effect Stability and Change	MS-LS2.A MS-LS2.C MS-LS4.C MS-LS1.D	Math: 6.SP.B.5 ELA/Literacy: WHST.6-8.1
6 INVESTIGATION Ups and Downs Students analyze data on population size to detect patterns over periods of time, and discover that there can be periods of relative stability and periods of small and large changes in population size. They consider what might cause changes in population size, including both biotic and abiotic changes in the environment.	Working towards MS-LS2-1, MS-LS2-4	Analyzing and Interpreting Data Engaging in Argument from Evidence	Patterns Cause and Effect Stability and Change	MS-LS2.A MS-LS2.C	Math: MP.2 ELA/Literacy: RST.6-8.3

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology NGSS edition					
7 LABORATORY Coughing Up Clues Students investigate and collect data on an owl's diet to determine the owl's place and role in a food web. They construct a simple model of a food web to begin understanding how matter and energy move in, through, and out of an ecosystem. In subsequent activities, students continue to develop their models.	Working towards MS-LS2-3	Constructing Explanations Planning and Carrying out Investigations Analyzing and Interpreting Data Developing and Using Models	Energy and Matter Systems and System Models	MS-LS2.A MS-LS2.B	Math: 6.RP.A.3 ELA/Literacy: RST.6-8.3
8 READING Eating for Matter and Energy Students deepen their understanding of food webs and the roles that different kinds of organisms play in an ecosystem. Students continue revising their owl food webs to model the flow of energy and to explain how disruptions to the ecosystem affect the food web. They also incorporate their initial understandings of the cycling of matter into their models. Student groups then create models to account for the fact that only 10% of the energy remains in an ecosystem from one level of the food web to the next.	Working towards MS-LS2-3, MS-LS2-2	Developing and Using Models Constructing Explanations	Energy and Matter Systems and System Models Connections to Nature of Science: Scientific Knowledge Assumes an Order and Consistency in Natural Systems	MS-LS2.B MS-LS2.A	Math: MP.2 MP.4 6.RP.A.1 ELA/Literacy: RST.6-8.7 WHST.6-8.9
9 LABORATORY Population Growth Students plan and carry out an investigation to determine the effect of resource availability on population growth in Paramecium. They collect, analyze, and interpret data to provide evidence that greater food availability results in greater population growth.	MS-LS2-1 assessment	Analyzing and Interpreting Data Planning and Carrying Out Investigations	Cause and Effect Energy and Matter Scale, Proportion, and Quantity	MS-LS2.A	Math: MP.2 6.RP.A.1 ELA/Literacy: WHST.6-8.1

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology NGSS edition					
10 INVESTIGATION Interactions in Ecosystems Students explore and explain the types of interactions among biotic and abiotic components in ecosystems. They consider the causes and effects of these interactions and learn that these types of interactions occur as patterns across all ecosystems. The activity provides an opportunity to assess student work related to Performance Expectation MS-LS2-2.	MS-LS2-2 assessment	Constructing Explanations	Patterns Cause and Effect	MS-LS2.A	Math: 6.EE.C.9 ELA/Literacy: WHST.6-8.1
11 LABORATORY Cycling of Matter Students carry out an investigation on decomposers to explore how matter cycles in an ecosystem. They add to their understanding of how the biotic and abiotic components of an ecosystem interact. They revise and expand their food web models, which already capture how energy flows through an ecosystem, to explain how matter cycles from the abiotic components of an ecosystem, through the biotic components, and back to the abiotic components.	Working towards MS-LS2-3	Developing and Using Models Planning and Carrying Out Investigations Constructing Explanations	Energy and Matter Systems and System Models Connections to Nature of Science: Scientific Knowledge Assumes an Order and Consistency in Natural Systems	MS-LS2.B MS-LS2.A	ELA/Literacy: RST.6-8.3
12 MODELING Modeling the Introduction of a New Species Students develop a model for an ecosystem and then introduce a new species to explain how this new component in the system affects the flow of energy and cycling of matter throughout the ecosystem.	MS-LS2-3 assessment	Developing and Using Models	Energy and Matter Systems and System Models Connections to nature of science: Scientific Knowledge Assumes an Order and Consistency in Natural Systems	MS-LS2.B MS-LS2.C	ELA/Literacy: WHST.6-8.1

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology NGSS edition					
<p>13 INVESTIGATION Abiotic Impacts on Ecosystems</p> <p>Students explore how abiotic changes in the environment can impact ecosystems. They explain how these abiotic disruptions affect the flow of energy and cycling of matter in ecosystems. These disruptions can lead to cycles of stability and change over time and at different scales. Students are assessed on their abilities to construct an explanation for why a top predator is the last organism to arrive in a disrupted ecosystem.</p>	<p>Working towards MS-LS2-4</p>	<p>Constructing Explanations</p>	<p>Stability and Change</p> <p>Energy and Matter</p>	<p>MS-LS2.C MS-LS2.B</p>	<p>ELA/Literacy: WHST.6-8.1</p>
<p>14 INVESTIGATION Effects of an Introduced Species</p> <p>Students use computers to analyze a large data set on the effects of the zebra mussel on the Hudson River ecosystem. They analyze and interpret data to argue how the introduction of the zebra mussel affected populations of other organisms as well as the abiotic environment. Students are assessed on how well they use empirical evidence to construct an argument for how a change to the biological component of an ecosystem affects other populations.</p>	<p>MS-LS2-4 assessment</p>	<p>Engaging in Argument from Evidence</p> <p>Using Mathematics and Computational Thinking</p> <p>Analyzing and Interpreting Data</p> <p>Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence</p>	<p>Cause and Effect</p> <p>Patterns</p> <p>Stability and Change</p>	<p>MS-LS2.A MS-LS2.C MS-LS4.D MS-ESS3.C</p>	<p>Math: 6.SP.B.5</p> <p>ELA/Literacy: WHST.6-8.1</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Ecology NGSS edition					
<p>15 TALKING IT OVER Too Many Mussels Students explore potential solutions to the invasive zebra mussel problem. Students engage in the design process by developing initial criteria and constraints by which to evaluate solutions. After reading about several actual solutions, they revise their criteria and constraints, and then argue for the best solution(s) to maintain the natural ecosystem. The activity provides an opportunity to assess student work related to Performance Expectation MS-LS2-5.</p>	MS-LS2-5 assessment	Engaging in Argument from Evidence	Stability and Change Connections to Nature of Science: Science Addresses Questions About the Natural and Material World	MS-LS4.D MS-ETS1.A MS-ETS1.B MS-ESS3.C	ELA/Literacy: RI.8.8 WHST.6-8.1
<p>16 PROJECTS Presenting the Facts Students explore how abiotic changes in the environment can impact ecosystems. They explain how these abiotic disruptions affect the flow of energy and cycling of matter in ecosystems. These disruptions can lead to cycles of stability and change over time and at different scales. Students are assessed on their abilities to construct an explanation for why a top predator is the last organism to arrive in a disrupted ecosystem.</p>		Obtaining, Evaluating, and Communicating Information	Cause and Effect Patterns Stability and Change	MS-LS2.A MS-LS2.C MS-LS4.D MS-ETS1.A MS-ETS1.B MS-ESS3.C	ELA/Literacy: RST.6-8.8 RI.8.8 WHST.6-8.2 SL.8.5

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Reproduction NGSS edition					
<p>Performance Expectation MS-LS1-4: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.</p>					
<p>Performance Expectation MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</p>					
<p>Performance Expectation MS-LS3-1: Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of an organism.</p>					
<p>Performance Expectation MS-LS3-2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.</p>					
<p>1. VIEW AND REFLECT: Joe’s Situation This activity introduces the fictional scenario of Joe, who has learned that he might have a genetic condition. Students engage in the practices of asking questions and obtaining, gathering, and communicating information as they attempt to understand Joe’s story. As they do this, they explore both the causes and effects of a genetic condition, beginning a focus on the crosscutting concepts of cause and effect and structure and function, which run throughout the unit. Also throughout the unit, students apply what they learn to Joe’s situation. In the final activity of the unit, they will make a recommendation to Joe.</p>	<p>Working towards MS-LS1-5, MS-LS3-1, MS-LS3-2</p>	<p>Asking Questions and Defining Problems Obtaining, Evaluating, and Communicating Information</p>	<p>Cause and Effect Structure and Function Connections to Nature of Science: Science Addresses Questions About the Natural and Material World</p>	<p>MS-LS1.B</p>	<p>ELA/Literacy: RST.6-8.2 WHST.6-8.9 SL.8.1</p>
<p>2. MODELING: Creature Features Students begin to use the practice of developing and using models to show and revise their ideas about genes and inheritance of traits. The crosscutting concepts of patterns and cause and effect provide helpful lenses for thinking about the results of an imaginary scenario in which animals are bred to produce two generations of offspring. This activity begins a sequence in which students explore core ideas and concepts related to patterns of inheritance of traits as a result of sexual reproduction. Students also begin to</p>	<p>Working towards MS-LS3-2</p>	<p>Developing and Using Models Constructing Explanations and Designing Solutions Engaging in Argument from Evidence</p>	<p>Patterns Cause and Effect</p>	<p>MS-LS1.B MS-LS3.B</p>	<p>ELA/Literacy: RST.6-8.7 WHST.6-8.1 WHST.6-8.9 SL.8.1</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Reproduction NGSS edition					
engage in scientific argumentation as they evaluate possible hypotheses.					
3. READING: Reproduction Students engage in the practice of obtaining information as they read about the cellular basis of sexual and asexual reproduction. This information will help them to revise their models and explanations for the inheritance of traits and prepare them for quantitative predictions of the incidence of traits in offspring.	Working towards MS-LS3-1, MS-LS3-2	Constructing Explanations and Designing Solutions Developing and Using Models Obtaining, Evaluating, and Communicating Information	Patterns Cause and Effect	MS-LS1.B MS-LS3.B	ELA/Literacy: RST.6-8.1 RST.6-8.4 RST.6-8.7 WHST.6-8.2 WHST.6-8.9
4. INVESTIGATION: Gene Combo Students use a coin-tossing model to investigate quantitatively the outcomes of breeding a second generation of offspring from heterozygous parents. The crosscutting concepts of patterns and cause and effect continue to be emphasized. This activity helps students understand how genes determine traits, distinguish between predicted and actual outcomes of such crosses, and further elaborate their model of inheritance of traits. This will lead into activities where students will learn about Mendel's work and will use Punnett squares as another model for predicting the outcomes of genetic crosses.	Working towards MS-LS3-2	Developing and Using Models Constructing Explanations and Designing Solutions Using Mathematics and Computational Thinking Analyzing and Interpreting Data Engaging in Argument from	Patterns Cause and Effect Scale, Proportion, and Quantity	MS-LS1.B MS-LS3.A MS-LS3.B	Mathematics: 6.RP.A.1 ELA/Literacy: RST.6-8.4

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Reproduction NGSS edition					
		Evidence			
<p>5. PROBLEM SOLVING: Gene Squares This activity introduces the use of Punnett squares as a model for predicting the ratios of both genotypes and phenotypes in the offspring of genetic crosses. Students use crosscutting concepts of patterns and cause and effect as they use Punnett squares to predict outcomes of crosses of various pairs of critters.</p>	Working towards MS-LS3-2	<p>Constructing Explanations and Designing Solutions</p> <p>Developing and Using Models</p> <p>Using Mathematics and Computational Thinking</p>	<p>Patterns</p> <p>Cause and Effect</p>	<p>MS-LS1.B</p> <p>MS-LS3.A</p> <p>MS-LS3.B</p>	<p>Mathematics: 6.RP.A.1</p> <p>ELA/Literacy RST.6-8.2 RST.6-8.4 RST.6-8.7</p>
<p>6. READING: Mendel, First Geneticist A reading on Gregor Mendel’s investigations and the principles of genetics he identified through his work provides a perspective on the history and nature of science and the data analysis, recognition of patterns, and use of mathematics central to this important advancement in explaining how genes cause traits. The reading provides data from Mendel’s experiments breeding pea plants and his application of ratios to his analysis and interpretation of his results. Students can compare Mendel’s findings, analysis, and model to their own work with the critter model.</p>	Working towards MS-LS3-2	<p>Analyzing and Interpreting Data</p> <p>Using Mathematics and Computational Thinking</p> <p>Obtaining, Evaluating, and Communicating Information</p> <p>Constructing Explanations and Designing Solutions</p>	<p>Cause and Effect</p> <p>Patterns</p> <p>Scale, Proportion, and Quantity</p> <p>Connections to Nature of Science: Science Is a Way of Knowing</p>	<p>MS-LS1.B</p> <p>MS-LS3.A</p> <p>MS-LS3.B</p>	<p>Mathematics: 6.RP.A.1</p> <p>ELA/Literacy: RST.6-8.7 RST.6-8.9</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Reproduction NGSS edition					
<p>7. LABORATORY: Do Genes Determine Everything?</p> <p>Students are introduced to two traits for seedling color in <i>Nicotiana</i> plants. They are then introduced to experimental design before they plan and conduct an Investigation to determine how selected environmental factors affect the phenotype of plant seedlings. They analyze their data to explain the interaction between genetic and environmental factors. They use this experience as the basis for a discussion of the interplay of genetic and environmental factors in determining traits in humans, as well as in plants.</p>	MS-LS1-5 assessment	<p>Analyzing and Interpreting Data</p> <p>Planning and Conducting Investigations</p> <p>Constructing Explanations and Designing Solutions</p>	<p>Cause and Effect</p> <p>Connections to Nature of Science: Science Is a Way of Knowing</p>	MS-LS1.B MS-LS3.B	<p>Mathematics:</p> <p>6.RP.A.1</p> <p>6.SP.B.5</p>
<p>8. READING: Show Me the Genes!</p> <p>Students obtain information from a reading that introduces the location of genes on chromosomes and the number of sets of chromosomes in sex cells and the rest of the body. This information helps explain some of the phenomena related to genes that students have been learning about, and also prepares them for future activities where they will model the cause-and- effect relationships between genes (and mutations) and protein structure and function.</p>	Working towards MS-LS3-1, MS-LS3-2	<p>Developing and Using Models</p> <p>Obtaining, Evaluating, and Communicating Information</p>	<p>Patterns</p> <p>Cause and Effect</p> <p>Structure and Function</p> <p>Scale, Proportion, and Quantity</p>	MS-LS1.B MS-LS3.A MS-LS3.B	<p>ELA/Literacy:</p> <p>RST.6-8.2</p> <p>RST.6-8.4</p> <p>RST.6-8.7</p> <p>WHST.6-8.2</p> <p>WHST.6-8.9</p>
<p>9. INVESTIGATION: Breeding Critters—More Traits</p> <p>Students model and explain additional patterns of inheritance as they explore cause-and-effect relationships for additional traits of the critters. These patterns help them model and explain the wide variation that can result from sexual reproduction.</p>	MS-LS3-2 assessment	<p>Constructing Explanations and Designing Solutions</p> <p>Developing and Using Models</p>	<p>Patterns</p> <p>Cause and Effect</p>	MS-LS1.B MS-LS3.A MS-LS3.B	<p>Mathematics:</p> <p>6.SP.B.5</p> <p>ELA/Literacy:</p> <p>RST.6-8.4</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Reproduction NGSS edition					
10. INVESTIGATION: Animal Behavior Students analyze and interpret data to create arguments that explain behavioral and other traits in animals that at first glance seem to be either neutral or perhaps even harmful. By looking for patterns in the data, students develop arguments about how these traits cause the individual to have higher reproductive success than those with different traits.	MS-LS1-4 assessment (animal traits)	Engaging in Argument from Evidence Analyzing and Interpreting Data	Cause and Effect Patterns	MS-LS1.B MS-LS4.C	Mathematics: 6.SP.A.2 6.SP.B.4 ELA/Literacy: RST.6-8.1 WHST.6-8.1
11. INVESTIGATION: Plant–Animal Interactions Students obtain information about flower pollination and its importance to plant reproduction. They consider a number of adaptive plant structures and traits that attract animal pollinators. Students construct an argument for how these traits cause the individual plant to have higher reproductive success than plants with different traits.	MS-LS1-4 assessment (plant-animal interactions)	Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	Cause and Effect Patterns Structure and Function	MS-LS1.B MS-LS4.C	ELA/Literacy: RST.6-8.1 R.I.6.8 WHST.6-8.1
12. MODELING: How Do Genes Produce Traits? This activity introduces the concept that a gene encodes for a protein, which has a specific function in the cell. These protein functions manifest as traits in the body. Students use a toober and pipe cleaners to model and generate explanations for how a gene’s sequence codes for a protein sequence. They continue using this model to explore how the protein sequence determines the protein structure and function. As students model structure and function, they also examine cause-and-effect relationships between gene sequence and protein function.	Working towards MS-LS3-1, MS-LS3-2	Developing and Using Models Constructing Explanations and Designing Solutions	Cause and Effect Structure and Function	MS-LS3.A	ELA/Literacy: RST.6-8.7

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Reproduction NGSS edition					
<p>13. Modeling: Fault in the Genes Students return to their three-dimensional protein models to begin investigating the cause-and-effect relationship between mutations and protein structure and function. The activity begins with a game that introduces students to different types of mutations: deletions, additions, and substitutions. Students then make predictions about how different mutations may affect their protein structure. Using the toobers and pipe cleaners, students model the mutations and the resulting changes to their protein structures. After investigating different types of mutations, students construct explanations for how a mutation in a gene leads to changes in body function, specifically how a mutation in the fibrillin-1 gene leads to Marfan syndrome symptoms.</p>	<p>MS-LS3-1 assessment Applying MS-LS3-2</p>	<p>Developing and Using Models</p> <p>Constructing Explanations and Designing Solutions</p> <p>Analyzing and Interpreting Data</p>	<p>Cause and Effect</p> <p>Structure and Function</p>	<p>MS-LS3.A MS-LS3.B</p>	<p>ELA/Literacy: RST.6-8.7</p>
<p>14. TALKING IT OVER: Advising Joe Students apply what they have learned to Joe’s scenario and create a written communication that explains the causes and effects of Marfan syndrome and the actions Joe and his family might take.</p>	<p>Applying MS-LS3-2, MS-LS1-5, MS-LS3-1</p>	<p>Obtaining, Evaluating, and Communicating Information</p>	<p>Cause and Effect</p> <p>Understandings About the Nature of Science: Science Addresses Questions About the Natural and Material World</p>	<p>MS-LS1.B MS-LS3.A MS-LS3.B</p>	<p>Math: 6.RP.A.1</p> <p>ELA/Literacy WHST.6-8.2</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Biomedical Engineering NGSS edition					
<p>Performance Expectation MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p> <p>Performance Expectation MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>Performance Expectation MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p> <p>Performance Expectation MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</p>					
<p>1. INVESTIGATION: Save Fred! Students are introduced to the process of engineering with a scenario that engages them in solving a simple problem. The activity elicits and builds on students’ ideas about how to develop a successful solution. The processes used by scientists and engineers are compared and contrasted.</p>	<p>Working towards MS-ETS1-1, MS-ETS1-3</p>	<p>Asking Questions and Defining Problems</p>		<p>MS-ETS1.A MS-ETS1.B</p>	
<p>2. INVESTIGATION: Me, an Engineer? Students are challenged to design tools and strategies to solve the practical problem of using one arm to complete daily tasks. Within the criteria and constraints of the problems, students navigate the environment and optimize their solutions. The activity concludes with an opportunity for students to define and analyze a design problem in their everyday lives.</p>	<p>Working towards MS-ETS1-1, MS-ETS1-3, MS-ETS1-4</p>	<p>Asking Questions and Defining Problems</p>	<p>Structure and Function</p> <p>Interdependence of Science, Engineering, and Technology</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World</p>	<p>MS-ETS1.A MS-ETS1.C MS-ETS1.B</p>	

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Biomedical Engineering NGSS edition					
<p>3. READING: Bionic Bodies Students explore the application of biomedical engineering through the case studies of three individuals. These cases show that individual needs, desires, and values help drive the technologies and the limitations of their use. Students read about the role of criteria and constraints in the design process.</p>	MS-ETS1-1 assessment	Asking Questions and Defining Problems	<p>Interdependence of Science, Engineering, and Technology</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World</p> <p>Structure and Function</p>	MS-ETS1.A	<p>ELA/Literacy: RST 6-8.1 RST 6-8.9 RST.6-8.2</p>
<p>4. DESIGN: Artificial Bone Model Students are challenged to design, build, and test models of an artificial bone to meet criteria. They analyze the quantitative data from different prototypes and combine ideas to optimize their design. The hands-on experience demonstrates the engineering design process without it yet defined.</p>	Working towards MS-ETS1-3, MS-ETS1-2, MS-ETS1-4	<p>Asking Questions and Defining Problems</p> <p>Developing and Using Models</p> <p>Constructing Explanations and Designing Solutions</p> <p>Analyzing and Interpreting Data</p> <p>Using Mathematics and Computational Thinking</p>	Structure and Function	MS-ETS1.A MS-ETS1.B MS-ETS1.C MS-LS1.A	<p>Math: MP.2 6.RP.A.1 7.RP.A.2</p> <p>ELA/Literacy: SL8.4</p>

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Biomedical Engineering NGSS edition					
5. DESIGN: Artificial Heart Valve Students apply the engineering design process to developing a model for an artificial heart valve. After reading about the societal need for this technology, students create initial prototype designs. Students test and evaluate their designs before redesigning them. They optimize their solutions in an iterative process that identifies the best characteristics of each prototype. Students compare designs with their peers and evaluate which ones meet the criteria and constraints of the problem.	MS-ETS1-3 assessment; Working towards MS-ETS1-2, MS-ETS1-4	Asking Questions and Defining Problems Developing and Using Models Construction Explanations and Designing Solutions Analyzing and Interpreting Data Engaging in Argument from Evidence	Influence of Science, Engineering, and Technology on Society and the Natural World Structure and Function	MS-ETS1.B MS-ETS1.C MS-LS1.A	Math: MP.2 ELA/Literacy: SL.8.4
6. READING: The Work of an Engineer Students explore the discipline of engineering in more detail. They read about the interplay between science, engineering, and technology in the development of new products. They consider the positive benefits and negative environmental consequences of biomedical advances.	Applying MS-ETS1-1	Asking Questions and Defining Problems	Interdependence of Science, Engineering, and Technology Influence of Science, Engineering, and Technology on Society and the Natural World Connections to Nature of Science	MS-ETS1.A	ELA/Literacy: RST.6-8.1 RST.6-8.9 RST.6-8.2 WHST.6-8.9

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Biomedical Engineering NGSS edition					
7. INVESTIGATION: Snack Bar Students examine food that has been designed for specific medical conditions. They evaluate designs using a systematic process to determine how each design meets the needs of a specific condition. The evaluation depends on mathematical reasoning and analyzing data to find the solution that best meets the criteria. Then students develop their own snack bar designs to address the needs of another condition.	MS-ETS1-2 assessment	Engaging in Argument from Evidence Constructing Explanations and Designing Solutions Using Mathematics and Computational Thinking	Interdependence of Science, Engineering, and Technology Influence of Science, Engineering, and Technology on Society and the Natural World	MS-ETS1.B MS-ETS1.A MS-LS1.C	Math: MP.2 7.EE.3
8. LABORATORY: Investigating Biomechanics Students explore the biomechanics of muscles and tendons in a chicken wing as background knowledge to later design a gripping device. This information on the structure and function of a wing is used to develop a model of natural movement. Students are introduced to the concept of biomimicry, which is a popular engineering approach that leads to a more limited, but often successful, solution.	Working towards MS-ETS1-4	Developing and Using Models Constructing Explanations and Designing Solutions Connections to Nature of Science	Structure and Function	MS-ETS1.A MS-ETS1.B MS-LS1.A	
9. DESIGN: Get a Grip Students use the approach of biomimicry to design, test, evaluate, and redesign a mechanical gripping device to meet criteria. They use the engineering design process to optimize the device in one of two ways. In doing so, they investigate the relationship between structure and function of the device and how the technology they developed can be applied.	MS-ETS1-4 assessment; Applying MS-ETS1-1; MS-ETS1-3	Asking Questions and Defining Problems Developing and Using Models Using Mathematics and Computational Thinking Constructing Explanations and Designing Solutions	Structure and Function Interdependence of Science, Engineering, and Technology Influence of Science, Engineering, and Technology on Society and the	MS-ETS1.A MS-ETS1.B MS-ETS1.C MS-LS1.A	ELA/Literacy: SL8.4

SEPUP Unit: Activity	Performance Expectation	Practices	Crosscutting Concepts	Disciplinary Core Ideas	Common Core ELA/Mathematics
Biomedical Engineering <i>NGSS edition</i>					
			Natural World		