



# 2021 Science 5-8 Curriculum

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*Aligned to 2020 NJSL*

Board of Education Adoption Date: April 27, 2021

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Every Student Every Day

# **2021 Science**

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# **Accommodations Addendum**

Curriculum Modifications for IEP's, 504's, ELL and Gifted and Talented

## **IEP and 504:**

Allow for extended time on homework and assessments as described in the student's plan

Allow use of calculator

Check for comprehension and understanding

Highlight or underline key words

Permit ample time for students to respond to questions

Clearly define limits and expectations

Encourage students to ask for needed assistance

Preferential seating

Repeating, clarifying or rewording directions

## **ELL**

Allow for alternate responses

Provide student with advanced notes

Allow for extended time on homework and assessments

Teachers modeling of what is expected and necessary steps to complete task

Provide simplified written and verbal instructions

Permit ample time for student to respond to questions

Encourage student to ask for needed assistance

Check for comprehension and understanding

Repeating, clarifying or rewording directions

Preferential seating

Allow use of eDictionary/technology to look up unknown word

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# **Overview of Science Assessments**

Grades 5-8

## **Unit Tests**

### **Grade 5**

Pre-Post Test

1. Variables
2. Mixtures and Solutions
3. Levers and Pulleys
4. Environments

### **Grade 6**

Pre-Post Test

1. Weather and Climate
2. History of Earth
3. Space Systems

### **Grade 7**

Pre-Post Test

1. Molecules to Organisms
2. Interactions, Energy and Dynamics
3. Heredity
4. Biological Evolution

### **Grade 8**

Pre-Post Test

1. Structures and Properties of Matter
2. Motion
3. Energy
4. Waves

## **Problem Solving/Graphing/Data**

### **Grades 5-8**

Pre-Post Test (August/May)

1. Test 1-November
2. Cumulative Test 2-January
3. Cumulative Test 3-March

## **Science Skills Assessment**

### **Grade 5 (Measurement Unit)**

1. Pre-test-@ April 8
2. Post-Test @ April 19

### **Grade 5-8 SSA 2021**

1. Test 1- September
2. Test 2- May

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# **Alternate Assessments**

## **Related Strategies**

### *Science*

Teachers will employ the following materials and strategies in the event such is needed based upon I&RS plan, 504, IEP or other reasons discussed with the principal:

1. Textbook alternate Chapter and Quiz assessments
2. CER Format
3. Verbalize complex procedures and natural processes
4. Calculator Versions
5. Hands on STEM Project
6. Supplemental multiple chapter tests for benchmarks
7. Collaborative Test
8. Portfolio of performance based tasks
9. Summary assessments in place of MC
10. Crib Sheet Tests

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**2021 Science 5-8  
Curriculum  
Units**

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# Grade 5 Science Curriculum 2021 Update

## Aligned to NJSL S 2020

### Variables Unit

<p><b><u>Essential Questions</u></b></p>	<p>What are variables in a system? How can data be used to communicate relationships between variables? How does changing a variable affect the outcome of an experiment?</p>
<p><b><u>Disciplinary Core Ideas</u></b></p> <p><b>ETS1.A: Defining and Delimiting Engineering Problems</b></p> <p><b>ETS1.B: Developing Possible Solutions</b></p> <p><b>ETS1.C: Optimizing the Design Solution</b></p>	<p>Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1)</p> <p>Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)</p> <p>At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)</p> <p>Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)</p> <p>Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)</p>

<b><u>Performance Task</u></b>	
<b>3-5-ETS1-1.</b>	<b>Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</b>
<b>3-5-ETS1-2.</b>	<b>Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</b>
<b>3-5-ETS1-3.</b>	<b>Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</b>
	<hr/> <ul style="list-style-type: none"> <li>• Observe and compare the behavior of pendulums</li> <li>• Experiment to find out what variables affect the number of cycles a pendulum makes in a unit of time</li> <li>• Relate pendulum length to the number of cycles it makes in a unit of time Predict the behavior of new pendulums, using a graph</li> <li>• Communicate findings</li> <li>• Observe and compare the buoyancy of different boats</li> <li>• Organize information on a graph</li> <li>• Relate capacity of boats to the mass they can hold before sinking</li> <li>• Predict the behavior of new boats, using a graph</li> <li>• Observe and compare the behavior of a standard plane system to modified plane systems</li> <li>• Conduct controlled experiments</li> <li>• Organize data in a flight log</li> <li>• Relate the effect of variables to the distance the plane travels Predict outcomes of plane flights</li> <li>• Observe and compare the behavior of objects flipped from a catapult</li> <li>• Organize and communicate results of investigations</li> <li>• Relate the effects of variables to the trajectory of objects</li> <li>• Predict the behavior of new objects on the catapult</li> </ul>



<b>Crosscutting Concepts</b>	<p><b>Influence of Science, Engineering, and Technology on Society and the Natural World</b> Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)</p>
<b>Science and Engineering Practices</b>	<p><b>Asking Questions and Defining Problems</b> Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)</p> <p><b>Planning and Carrying Out Investigations</b> Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3)</p> <p><b>Constructing Explanations and Designing Solutions</b> Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)</p>

## MIXTURES AND SOLUTIONS UNIT

<b><u>Essential Questions</u></b>	<p>What are mixtures?</p> <p>How can solids be separated from a liquid in a mixture?</p> <p>How do different variables affect solubility and concentration of a solution?</p> <p>How can observable characteristics be used to identify chemical or physical changes?</p>
<b><u>Disciplinary Core Ideas</u></b>  <b>PS1.A: Structure and Properties of Matter</b>          <b>PS1.B: Chemical Reactions</b>	<p>Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. (5-PS1-1)</p> <p>The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)</p> <p>Measurements of a variety of properties can be used to identify materials. (5-PS1-3)</p> <p>When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)</p> <p>No matter what reaction or change in properties occurs, the total weight of the substances does not change. (5-PS1-2)</p>
<b><u>Performance Task</u></b>  <b>5-PS1-1</b>  <b>5-PS1-2</b>	<p><b>Develop a model to describe that matter is made of particles too small to be seen.</b></p> <p><b>Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.</b></p>

<p><b>5-PS1-3</b></p> <p><b>5-PS1-4</b></p> <p><b>5-PS2-1</b></p>	<p><b>Make observations and measurements to identify materials based on their properties.</b></p> <p><b>Conduct an investigation to determine whether the mixing of two or more substances results in new substances.</b></p> <p><b>Support an argument that the gravitational force exerted by Earth on objects is directed down.</b></p> <hr/> <ul style="list-style-type: none"> <li>• Measure solids and liquids to make mixtures and solutions.</li> <li>• Observe the behavior of solid materials in water</li> <li>• Compare the mass of a mixture to the mass of its parts</li> <li>• Organize observations on a student sheet</li> <li>• Communicate observations</li> <li>• Observe the behavior of a saturated solution</li> <li>• Compare the quantities of two solid materials required to saturate a volume of water</li> <li>• Relate the added mass of the solution to the dissolved materials in the saturated solution</li> <li>• Conservation of matter</li> <li>• Compare the solubility of materials in water</li> <li>• Relate the concentrations of a solution to the amount of solid materials dissolved in a volume of water</li> <li>• Determine the relative concentrations of solutions</li> <li>• Measure solids and liquids while conducting chemical reactions</li> <li>• Compare properties of precipitates to determine their identities</li> <li>• Determine all possible pairs of reactants involving a set of three chemicals</li> </ul>
<p><b>Crosscutting Concepts</b></p>	<p><b>Cause and Effect</b></p> <p>Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4)</p>

	<p><b>Scale, Proportion, and Quantity</b>  Natural objects exist from the very small to the immensely large. (5-PS1-1)  Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2),(5-PS1-3)</p>
<p><b>Science and Engineering Practices</b></p>	<p><b>Developing and Using Models</b>  Develop a model to describe phenomena (5-PS1-1)</p> <p><b>Planning and Carrying Out Investigations</b>  Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)  Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)</p> <p><b>Using Mathematics and Computational Thinking</b>  Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)</p>

## Sun, Earth, Moon System UNIT

<p><b><u>Essential Questions</u></b></p>	<p>How does distance from Earth affect the apparent brightness of a star?</p> <p>How do shadows change throughout the day?</p> <p>How do the patterns of movement of the Earth result in night and day and help define time periods and location?</p>
<p><b><u>Disciplinary Core Ideas</u></b></p> <p><b>ESS1.A: The Universe and its Stars</b></p> <p><b>ESS1.B: Earth and the Solar System</b></p>	<p>The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth (5-ESS1-1)</p> <p>The orbits of Earth around the sun and the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (ESS1-2)</p>
<p><b><u>Performance Task</u></b></p> <p><b>5-ESS1-1</b></p> <p><b>5-ESS1-2</b></p>	<p>Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.</p> <p>Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and seasonal appearance of some stars in the night sky.</p>

	<ul style="list-style-type: none"> <li>• Compare brightness and distance of two identical flashlights, as well as two flashlights of different brightness.</li> <li>• Create a model of stars in order of their distance from Earth from nearest to farthest away.</li> <li>• Observe and measure the change in length of shadows as the light source moves overhead</li> <li>• Organize observations on a data table</li> <li>• Interpret diagrams to identify Earth's rotation on its axis and how it affects day and night</li> <li>• Create a model to show the moon circling around the Earth as Earth is circling around the sun.</li> </ul>
<b>Crosscutting Concepts</b>	<p><b>Patterns</b> similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2)</p> <p><b>Scale, Proportion, and Quantity</b> Natural objects exist from the very small to the immensely large. (5-ESS1-1)</p>
<b>Science and Engineering Practices</b>	<p><b>Analyzing and Interpreting Data</b> Represent data in graphical displays (bar graphs pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2)</p> <p><b>Engaging in Argument from Evidence</b> Support an argument with evidence, data, or a model. (5-ESS1-1)</p>



## Earth's Systems UNIT

<p><b><u>Essential Questions</u></b></p>	<p>What are Earth's systems?</p> <p>How do Earth's systems interact?</p> <p>How do humans affect Earth's systems?</p>
<p><b><u>Disciplinary Core Ideas</u></b></p> <p><b>ESS2.A: Earth Materials and Systems</b></p> <p><b>ESS2.C: The Roles of Water in Earth's Surface Processes</b></p> <p><b>ESS3.C: Human Impacts on Earth Systems</b></p>	<p>Earth's major systems are the geosphere, hydrosphere, atmosphere and the biosphere. These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with landforms to determine patterns of weather. (5-ESS2-1)</p> <p>Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)</p> <p>Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)</p>
<p><b><u>Performance Task</u></b></p> <p><b>5-ESS2-1</b></p> <p><b>5-ESS2-2</b></p> <p><b>5-ESS3-1</b></p>	<p>Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.</p> <p>Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth</p> <p>Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources, environment, and address climate change issue</p>

	<ul style="list-style-type: none"> <li>• Observe Earth's systems through photos and identify an item that represents each system.</li> <li>• Read a data table and create a circle graph of freshwater sources.</li> <li>• Earth system interaction model - cloud formation</li> <li>• Identify cloud formation and rain shadow through diagrams.</li> <li>• Develop a model to show the formation of a sea arch.</li> <li>• Model how Earth's systems interact by recording the temperature change of soil vs water.</li> <li>• Identify positive and negative interactions between humans and Earth's systems.</li> <li>• Interpret diagrams to identify methods to prevent soil erosion.</li> <li>• Compare and contrast renewable vs nonrenewable energies.</li> </ul>
<b>Crosscutting Concepts</b>	<p><b>Scale, Proportion, and Quantity</b> Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2)</p> <p><b>Systems and Systems Models</b> A system can be described in terms of its components and their interactions. (5-ESS2-1) (5-ESS3-1)</p> <p><b>Science Addresses Questions About the Natural and Material World.</b> Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3)</p>
<b>Science and Engineering Practices</b>	<p><b>Developing and Using Models</b> Develop a model using an example to describe a scientific principle (5-ESS2-1)</p> <p><b>Using Mathematics and Computational Thinking</b> Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)</p> <p><b>Obtaining, Evaluating, and Communicating Information</b></p>



	Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)
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## ENVIRONMENTS UNIT

<p><b><u>Essential Questions</u></b></p>	<p>What factors make up an organism's environment?</p> <p>How do environmental factors affect an organism's survival, growth, and reproduction?</p> <p>How do organisms affect the conditions in their environments?</p> <p>How do humans interact with the environment?</p>
<p><b><u>Disciplinary Core Ideas</u></b></p> <p><b>PS3.D: Energy in Chemical Processes and Everyday Life</b></p> <p><b>LS1.C: Organization for Matter and Energy Flow in Organisms</b></p> <p><b>LS2.A: Interdependent Relationships in Ecosystems</b></p> <p><b>LS2.B: Cycles of Matter and Energy</b></p>	<p>The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)</p> <p>Plants acquire their material for growth chiefly from air and water. (5-LS1-1)</p> <p>The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)</p> <p>Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die.</p>

<p><b>Transfer in Ecosystems</b></p> <p><b>ESS3.C: Human Impacts on Earth Systems</b></p>	<p>Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)</p> <p>Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)</p>
<p><b><u>Performance Task</u></b></p> <p><b>5-PS3-1.</b></p> <p><b>5-LS1-1.</b></p> <p><b>5-LS2-1.</b></p> <p><b>5-ESS3-1</b></p>	<p><b>Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.</b></p> <p><b>Support an argument that plants get the materials they need for growth chiefly from air and water.</b></p> <p><b>Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.</b></p> <p><b>Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.</b></p> <hr/> <ul style="list-style-type: none"> <li>• Observe and describe changes in a terrarium and in an aquarium over time</li> <li>• Organize and communicate observations</li> <li>• Set up and observe animal investigations</li> <li>• Relate the behavior of an animal to environmental factors</li> <li>• Conduct a plant experiment to determine range of tolerance</li> <li>• Relate differences in growth to the factor of water</li> <li>• Use a chemical indicator to indirectly measure an environmental factor</li> <li>• Use technology to monitor a factor in our local environment</li> <li>• Research the impact of human activities on our local environment and other ecosystems</li> </ul>

	<ul style="list-style-type: none"> <li>• Communicate findings</li> <li>• Describe the natural processes that occur over time in places where direct human impact is minimal</li> <li>• Identify biotic and abiotic elements</li> <li>• Describe the relationships among biotic and abiotic factors</li> <li>• Relate the characteristics of a population, community, and ecosystem.</li> <li>• Use data to construct a food web</li> </ul>
<b>Crosscutting Concepts</b>	<p><b>Energy and Matter</b> Energy can be transferred in various ways and between objects. (5-PS3-1)</p> <p>Matter is transported into, out of, and within systems. (5-LS1-1)</p> <p><b>Systems and System Models</b> A system can be described in terms of its components and their interactions. (5-LS2-1) (5-ESS3-1)</p>
<b>Science and Engineering Practices</b>	<p><b>Developing and Using Models</b> Use models to describe phenomena. (5-PS3-1) (5-LS2-1)</p> <p><b>Engaging in Argument from Evidence</b> Support an argument with evidence, data, or a model. (5-LS1-1)</p>

### Unit Timeline/Map

Unit	Typical Timeline
VARIABLES UNIT	September – November
MIXTURES AND SOLUTIONS UNIT	November – February
SUN, EARTH, MOON SYSTEM UNIT	February – March
EARTH SYSTEMS UNIT	March - April
MEASUREMENT W MATH	April (pre-NJSLA)
ENVIRONMENTS UNIT	May - June

## **Differentiation Strategies**

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary, to address needs of at risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments
- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusion
- Allow for extended time on homework and assessments as described in the student's plan
- Allow use of calculator
- Check for comprehension and understanding
- Highlight or underline key words
- Permit ample time for student to respond to questions
- Clearly define limits and expectations
- Encourage student to ask for needed assistance
- Preferential seating
- Repeating, clarifying or rewording directions
- Allow for alternate responses
- Provide student with advanced notes
- Allow for extended time on homework and assessments
- Teacher modeling of what is expected and necessary steps to complete task
- Provide simplified written and verbal instructions
- Permit ample time for student to respond to questions
- Repeating, clarifying or rewording directions
- Allow use of eDictionary/technology to look up unknown words

## **Interdisciplinary Connections Math/Science Grade 5**

1. Creation of tables and charts for collection and comparison of scientific data #5OA3
2. Calculating volume and mass to determine density #5MD3A
3. Averaging results for comparison of scientific data
4. Create concrete and picture graphs to organize, display, and communicate data
5. Proportions to create mixtures and solutions
6. Conversions within metrics system for accurate results
7. Graphing of results for analysis to present findings
8. Patterns for identification of crystals
9. Two-coordinate grids for comparison of dependent/independent variables.
10. Using a graph as a tool to make predictions

11. Identifying a range of tolerance for organisms
12. Comparing angles for determination of outcomes within controlled experiments
13. Produce/create patterns in tables and graphs to help identify trends
14. Problem solving to carry out plans and verify results
15. Reading and measuring in metric units for tabulation of results

## **Instructional Materials**

<b>Grade Level</b>	<b>Title</b>	<b>Primary / Supplemental</b>
<b>Fifth – Eighth</b>	<b>Foss Modules &amp; Science Stories</b>	<b>Primary Leveled</b>
<b>Fifth</b>	<b>3D Science: Triumph Learning '17</b>	<b>Primary Leveled</b>
<b>Sixth</b>	<b>Earth Science: Prentice Hall '07</b>	<b>Primary Leveled</b>
<b>Seventh</b>	<b>Life Science: Prentice Hall '07</b>	<b>Primary Leveled</b>
<b>Eighth</b>	<b>Physical Science: Prentice Hall '07</b>	<b>Primary Leveled</b>

## **Career Readiness**

- 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes
- 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification
- 9.2.5.CAP.7: Identify factors to consider before starting a business.

## **Life Literacies & Technology**

- 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
- 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue
- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity
- 9.4.5.CI.4: Research the development process of a product and identify the role of failure as a part of the creative process

9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process

9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem

9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global

9.4.5.DC.8: Propose ways local and global communities can engage digitally to participate in and promote climate action

9.4.5.IML.2: Create a visual representation to organize information about a problem or issue

9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data.

9.4.5.TL.3: Format a document using a word processing application to enhance text, change page formatting, and include appropriate images graphics, or symbols.

9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively

9.4.5.TL.5: Collaborate digitally to produce an artifact

## Unit 1: Weather and Climate

[illegible]



<b>ESS3.B: Natural Hazards</b>	<i>Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2)</i>
<b>ESS3.D: Global Climate Change</b>	<i>Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)</i>
<u>Engineering Design</u>	
<b>ETS1.A: Defining and Delimiting Engineering Problems</b>	<i>The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)</i>
<b>ETS1.B: Developing Possible Solutions</b>	<p><i>A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)</i></p> <p><i>There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)</i></p> <p><i>Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)</i></p> <p><i>Models of all kinds are important for testing solutions. (MS-ETS1-4)</i></p>
<b>ETS1.C: Optimizing the Design Solution</b>	<p><i>Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)</i></p> <p><i>The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)</i></p>
<u>Performance Task</u>	

<p><b>MS-ESS2-4.</b></p>	<p><b>Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.</b></p> <ul style="list-style-type: none"> <li>• Earth's fresh and salt water distribution demonstration</li> <li>• Play water cycle game and discuss results</li> <li>• Create diagram of the water cycle and main cloud types</li> </ul>
<p><b>MS-ESS2-5.</b></p>	<p><b>Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.</b></p> <ul style="list-style-type: none"> <li>• Use weather tools to measure weather factors</li> <li>• Design experiment to prove air has mass</li> <li>• Design models of how wind is created</li> <li>• Observe and draw local winds</li> <li>• View and read pressure maps</li> <li>• Label North American air masses</li> <li>• View animations of different fronts</li> <li>• View and read weather map symbols</li> </ul>
<p><b>MS-ESS2-6.</b></p>	<p><b>Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.</b></p> <ul style="list-style-type: none"> <li>• Heat and cool different Earth materials and graph data</li> <li>• Design and perform conduction experiments with cold and hot water and aluminum and steel bars</li> <li>• Successfully layer liquids with different densities and temperatures and report findings</li> <li>• View convection chamber</li> <li>• Research assigned climate regions with group</li> </ul>
<p><b>MS-ESS3-2.</b></p>	<p><b>Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.</b></p> <ul style="list-style-type: none"> <li>• Hurricanes PBT</li> <li>• Severe weather picture dictionaries</li> <li>• Bill Nye "Storms"</li> <li>• Watch "Storm Chasers"</li> </ul>
<p><b>MS-ESS3-5.</b></p>	<p><b>Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.</b></p> <ul style="list-style-type: none"> <li>• Climate change VR lesson</li> <li>• View data on the NASA website</li> <li>• Read and discuss the factors of climate change</li> <li>• Global Warming PBT</li> </ul>
<p><u>Engineering Design</u></p> <p><b>MS-ETS1-1.</b></p>	<p><b>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</b></p>



	<p>Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)</p> <p><b><u>Stability and Change</u></b></p> <p>Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)</p> <p><b><u>Patterns</u></b></p> <p>Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)</p> <p><b><u>Influence of Science, Engineering, and Technology on Society and the Natural World</u></b></p> <p>All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)</p> <p>The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)</p>
<p><b><u>Science and Engineering Practices</u></b></p>	<p><b><u>Asking Questions and Defining Problems</u></b></p> <p>Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5)</p> <p>Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)</p> <p><b><u>Developing and Using Models</u></b></p> <p>Develop a model to describe unobservable mechanisms. (MS-ESS2-4)</p> <p>Develop and use a model to describe phenomena. (MS-ESS2-6)</p> <p>Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)</p> <p><b><u>Planning and Carrying Out Investigations</u></b></p> <p>Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5)</p>

	<p><b><u>Analyzing and Interpreting Data</u></b></p> <p>Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2), (MS-ETS1-3)</p> <p><b><u>Engaging in Argument from Evidence</u></b></p> <p>Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)</p>
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## Grade 6 Earth Science Curriculum 2021 Aligned to NJSLS 2020

### Unit 2: History of Earth

<p><b><u>Essential Questions</u></b></p>	<p>How is Earth's history organized on the geologic time scale?          How do rocks and fossils provide evidence of past life and environmental conditions?          How do tectonic processes recycle sea floors?          How have the planet's systems interacted over time?          How does matter and energy cycle through the rock cycle?          What is Pangaea, and what evidence do we?          What effect does water movement have on the Earth's surface features and formations?          What are limited resources and what is the importance of preserving minerals, soil, and freshwater?          How can studying past natural disasters help predict future events?          How can humans minimize their impact on the environment?</p>
<p><b><u>Disciplinary Core Ideas</u></b></p>  <p><b>ESS1.C: The History of Planet Earth</b></p>          <p><b>ESS2.A: Earth's Materials and Systems</b></p>          <p><b>ESS2.B: Plate Tectonics and Large-Scale System Interactions</b></p>	<p><i>The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4)</i></p> <p><i>Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3)</i></p> <p><i>The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)</i></p> <p><i>All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)</i></p> <p><i>Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)</i></p>

<p><b>ESS2.C: The Roles of Water in Earth's Surface Processes</b></p> <p><b>ESS3.A: Natural Resources</b></p> <p><b>ESS3.B: Natural Hazards</b></p> <p><b>ESS3.C: Human Impacts on Earth Systems</b></p>	<p><i>Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)</i></p> <p><i>Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)</i></p> <p><i>Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2)</i></p> <p><i>Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3)</i></p> <p><i>Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-3),(MS-ESS3-4)</i></p>
<p><b><u>Performance Task</u></b></p> <p><b>MS-ESS1-4.</b></p> <p><b>MS-ESS2-1.</b></p>	<p><b>Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.</b></p> <ul style="list-style-type: none"> <li>• Envelope observation and inference investigation</li> <li>• Correlate rock layers from two locations in the Grand Canyon</li> <li>• Create personal history timeline in the format of the geological time scale</li> <li>• Read how periods of time on the geologic time scale are organized</li> <li>• Map out Earth's history on a 45m mason line</li> <li>• Identify index fossils at the Grand Canyon and correlate index fossils to determine relative age of rock layers</li> <li>• Read about absolute dating</li> </ul> <p><b>Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.</b></p> <ul style="list-style-type: none"> <li>• Examine the three types of sedimentary rocks from the Grand Canyon and discuss their characteristics</li> <li>• Perform processes of sedimentary rock formation by creating layers of sandstone, shale, and limestone</li> <li>• Examine, describe, and identify samples of igneous and metamorphic rocks</li> </ul>

<p><b>MS-ESS2-2.</b></p>	<ul style="list-style-type: none"> <li>• View cross section of the Earth and discuss igneous and metamorphic rock formation</li> <li>• Play rock cycle game lab, answer questions, and discuss findings</li> </ul> <p><b>Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.</b></p> <ul style="list-style-type: none"> <li>• Watch National Geographic Grand Canyon documentary</li> <li>• View and discuss images of differential erosion</li> <li>• Create sand by shaking rocks in a jar while collecting data and making observations</li> <li>• Watch Bill Nye "Erosion" video</li> <li>• Test affect of temperature on chemical weathering by dissolving antacid tablets in varying temperatures of water</li> </ul>
<p><b>MS-ESS2-3.</b></p>	<p><b>Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.</b></p> <ul style="list-style-type: none"> <li>• View images of continental movement and fossils as evidence for plate movement</li> <li>• View video clips of different plate boundaries</li> </ul>
<p><b>MS-ESS3-1.</b></p>	<p><b>Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.</b></p> <ul style="list-style-type: none"> <li>• Research assigned mineral and present to the class</li> <li>• Analyze images showing distribution of fossil fuels and groundwater and discuss processes causing the distribution</li> </ul>
<p><b>MS-ESS3-2.</b></p>	<p><b>Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.</b></p> <ul style="list-style-type: none"> <li>• Volcano PBT</li> </ul>
<p><b>MS-ESS3-3.</b></p>	<p><b>Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.</b></p> <ul style="list-style-type: none"> <li>• Research water and soil conservation methods</li> <li>• Research methods for greenhouse gas emission reduction</li> </ul>
<p><b>MS-ESS3-4.</b></p>	<p><b>Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.</b></p>
<p><b><u>Crosscutting Concepts</u></b></p>	<p><b><u>Patterns</u></b></p>



	<p>Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems. (MS-ESS2-3)</p> <p>Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)</p> <p><b><u>Scale, Proportion, and Quantity</u></b></p> <p>Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-4),(MS-ESS2-2)</p> <p><b><u>Stability and Change</u></b></p> <p>Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)</p> <p><b><u>Cause and Effect</u></b></p> <p>Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1), (MS-ESS3-4)</p> <p>Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)</p> <p><b><u>Influence of Science, Engineering, and Technology on Society and the Natural World</u></b></p> <p>All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-1), (MS-ESS3-4)</p> <p>The uses of technologies and limitations on their use are driven by people's needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2),(MS-ESS3-3)</p> <p><b><u>Science Addresses Questions about the Natural and Material World</u></b></p> <p>Science knowledge can describe consequences of actions but does not make the decisions that society takes. (MS-ESS3-4)</p>
<p><b><u>Science and Engineering Practices</u></b></p>	<p><b><u>Analyzing and Interpreting Data</u></b></p> <p>Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)</p> <p>Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2)</p>

	<p><b><u>Constructing Explanations and Designing Solutions</u></b></p> <p>Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS- ESS1-4),(MS-ESS2-2),(MS-ESS3-1)</p> <p>Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)</p> <p><b><u>Scientific Knowledge is Open to Revision in Light of New Evidence</u></b></p> <p>Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)</p> <p><b><u>Developing and Using Models</u></b></p> <p>Develop and use a model to describe phenomena. (MS- ESS2-1)</p> <p><b><u>Engaging in Argument from Evidence</u></b></p> <p>Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)</p>
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## Unit 3: Space Systems

<b><u>Essential Questions</u></b>	<p>How do the sun, moon, and stars move in the sky when viewed from Earth?</p> <p>What is Earth's place in the Universe?</p> <p>What makes up our solar system and how does gravity govern the movement of objects in our solar system?</p> <p>How can the motion of the Earth, sun, and moon explain seasons and eclipses?</p> <p>How was the universe formed?</p>
<b><u>Disciplinary Core Ideas</u></b>  <b>ESS1.A: The Universe and It's Stars</b>          <b>ESS1.B: Earth and the Solar System</b>	<p><i>Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.</i> (MS-ESS1-1)</p> <p><i>Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.</i> (MS-ESS1-2)</p> <p><i>The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.</i> (MS-ESS1-2),(MS-ESS1-3)</p> <p><i>This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.</i> (MS-ESS1-1)</p> <p><i>The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.</i> (MS-ESS1-2)</p>
<b><u>Performance Task</u></b>	<p><b>MS-ESS1-1.</b></p> <p><b>Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.</b></p> <ul style="list-style-type: none"> <li>● Calculate and graph day light hours from given data</li> <li>● Use Sun-Earth Model to identify and model seasonal variation in day light length</li> <li>● Use flashlights and a globe to investigate beam spreading and solar angle</li> </ul>

<p><b>MS-ESS1-2.</b></p>	<ul style="list-style-type: none"> <li>● Record the moon phases on a nightly moon log</li> <li>● Use a light bulb and Styrofoam balls to investigate moon phases and eclipses</li> <li>● Watch Bill Nye “Moon”</li> <li>● Research an assigned constellation and present to the class</li> <li>● Create a planisphere to locate constellations in the night sky</li> </ul> <p><b>Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.</b></p> <ul style="list-style-type: none"> <li>● View animations and discuss the role of gravity on the origin and rotation of the moon around the Earth</li> <li>● View images and video clips on the affect of gravity on tides</li> <li>● Discuss the role of gravity in the Big Bang Theory</li> </ul> <p><b>Analyze and interpret data to determine scale properties of objects in the solar system.</b></p> <ul style="list-style-type: none"> <li>● Create a scaled model of the moon and Earth, using a 12cm diameter globe and aluminum foil</li> <li>● Use string and tape to create a scaled model of the distances between the planets in our solar system</li> <li>● Research an assigned planet in a group, create a presentation, and present to the class</li> </ul>
<p><b><u>Crosscutting Concepts</u></b></p>	<p><b><u>Patterns</u></b></p> <p>Patterns can be used to identify cause and effect relationships. (MS-ESS1-1)</p> <p><b><u>Scale, Proportion, and Quantity</u></b></p> <p>Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3)</p> <p><b><u>Systems and System Models</u></b></p> <p>Models can be used to represent systems and their interactions. (MS-ESS1-2)</p> <p><b><u>Interdependence of Science, Engineering, and Technology</u></b></p> <p>Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)</p> <p><b><u>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</u></b></p>

	Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1), (MS-ESS1-2)
<b><u>Science and Engineering Practices</u></b>	<b><u>Developing and Using Models</u></b> Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2)  <b><u>Analyzing and Interpreting Data</u></b> Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)

## Unit Timeline/Map

Unit	Typical Timeline
<b>Weather &amp; Climate</b>	<b>September – November</b>
<b>History of Earth</b>	<b>December – February</b>
<b>Science PS / Skills</b>	<b>Mid-April</b>
<b>Space Systems</b>	<b>April - June</b>

## Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary to address needs of at risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments
- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusion
- Allow for extended time on homework and assessments as described in the student's plan
- Allow use of calculator
- Check for comprehension and understanding
- Highlight or underline key words
- Permit ample time for student to respond to questions
- Clearly define limits and expectations
- Encourage student to ask for needed assistance

- Preferential seating
- Repeating, clarifying or rewording directions
- Allow for alternate responses
- Provide student with advanced notes
- Allow for extended time on homework and assessments
- Teacher modeling of what is expected and necessary steps to complete task
- Provide simplified written and verbal instructions
- Permit ample time for student to respond to questions
- Repeating, clarifying or rewording directions
- Allow use of eDictionary/technology to look up unknown words

## **Interdisciplinary Connections**

1. Use of formulas in density and graphing lessons #6NS8
2. Working with decimals and rounding when collecting data during investigations #6SN3
3. Making predictions of outcomes before performing an investigation
4. Making measurements with rulers such as the size of granite pieces during weathering investigation
5. Distributions such as the distribution of fresh and salt water on the Earth
6. Collection and interpretation of data in most investigations such as the heating of various Earth materials
7. Use of variables such as time, distance, and mass when discussing erosion or gravity
8. Finding percentages when making circle graphs
9. Finding the volume of liquids and solids when finding density of materials
10. Use of positive and negative integers when discussing temperature
11. Use of fractions during graphing unit
12. Use of calculators to find density of liquids as well as the average granite size during weathering investigation
13. Finding elapsed time from sunrise and sunset times during seasons unit
14. Using proportions when comparing the size of celestial bodies
15. The idea of balancing when learning about air pressure, equilibrium, and wind formation
16. Making models of wind formation and habitable homes on other planets
17. Making designs/creating a plan when determining if air has mass

## Instructional Materials

Grade Level	Title	Primary / Supplemental
Fifth – Eighth	Foss Modules & Science Stories	Primary Levelled
Sixth	Earth Science: Prentice Hall '07	Primary leveled
Seventh	Life Science : Prentice Hall '07	Primary Levelled
Eighth	Physical Science : Prentice Hall '07	Primary leveled
Eighth	Pilot: HMH Science Dimensions Chemistry Unit	Supplemental

## Career Readiness

- 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest.
- 9.2.8.CAP.9: Analyze how a variety of activities related to career preparation (e.g., volunteering, apprenticeships, structured learning experiences, dual enrollment, job search, scholarships) impacts post-secondary options.
- 9.2.8.CAP.10: Evaluate how careers have evolved regionally, nationally, and globally.
- 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.
- 9.2.8.CAP.19: Relate academic achievement, as represented by high school diplomas, college degrees, and industry credentials, to employability and to potential level

## Life Literacies & Technology

- 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions
- 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4,6.1.8.CivicsDP.1)
- 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping
- 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change
- 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem

# Grade 7 Life Science 2021

**Aligned to NJSLA 2020**

## UNIT 1- From molecules to organisms: Structure and processes

<b><u>Essential question</u></b>	How can you explain the ways in which cells contribute to the overall structure and function of living organisms?
<b><u>Disciplinary Core Ideas</u></b>	
<b>LS1.A: Structure and Function</b>	<p><i>All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).</i></p> <p><i>Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.</i></p> <p><i>In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.</i></p>
<b>LS1.D: Information Processing</b>	<p><i>Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.</i></p>
<b><u>Performance task</u></b>	
<b>MS-LS1-1.</b>	<p><b>Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.</b></p> <ul style="list-style-type: none"> <li>• View single-celled organisms using microscope (Amoeba, paramecium and euglena)</li> <li>• View samples of plant and animal tissue and identify the cells</li> <li>• Prepare a wet-mount slide of onion rind and use the microscope to view onion cells (multicellular organism)</li> </ul>
<b><u>Performance task</u></b>	
<b>MS-LS1-2</b>	<p><b>Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.</b></p> <ul style="list-style-type: none"> <li>• Students will construct a 3-dimensional model of a plant or an animal cells</li> <li>• Students will use "Cell city" analogy to demonstrate how the individual cell parts contribute to the overall function of the cell</li> <li>• Students will conduct an investigation showing the role of the cell membrane in osmosis and diffusion</li> </ul>



<p><b><u>Performance task</u></b></p> <p><b>MS-LS1-3</b></p>	<p><b>Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.</b></p> <ul style="list-style-type: none"> <li>• Construct a paper model to show the relationship between cells, tissues, organs and organ systems</li> <li>• Identify the levels of organization from cells to organ systems in each of the following Circulatory system Respiratory System Digestive System Excretory system Muscular system Nervous system</li> <li>• Show how all of the systems listed interact with each other to facilitate the smooth operation of the human body</li> </ul>
<p><b>MS-LS1-6</b></p> <p><b>(PS3.D-Energy in chemical Processes and Everyday life)</b></p>	<p>Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and the flow of energy into and out of organisms</p> <ul style="list-style-type: none"> <li>• Identify the reactants and products in photosynthesis</li> <li>• Identify the sun as the energy source for photosynthesis</li> <li>• Identify the reactants and products in cellular respiration</li> <li>• Identify the energy source in cellular respiration</li> <li>• Create a Venn diagram comparing and contrasting photosynthesis and cellular respiration</li> </ul>
<p><b><u>Performance task</u></b></p> <p><b>MS-LS1-8</b></p>	<p><b>Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories</b></p> <p>Students will use <a href="http://brainu.org/resources/MNSTDS">http://brainu.org/resources/MNSTDS</a> to</p> <ul style="list-style-type: none"> <li>• Model working neural circuits using three types of neurons (motor, sensory, and interneurons).</li> <li>• draw and label a neural circuit using a motor neuron, sensory neuron, and interneuron, indicating the direction of neural communication.</li> <li>• identify and draw a motor neuron, a sensory neuron, and an interneuron.</li> </ul>
<p><b>Crosscutting concepts</b></p>	<p><b><u>Scale, Proportion, and Quantity</u></b></p> <p>Phenomena that can be observed at one scale may not be observable at another scale.</p> <p><b><u>Interdependence of Science, Engineering, and Technology</u></b></p> <p><input type="checkbox"/> Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.</p> <p><b><u>Cause and Effect</u></b></p>

	<p>Cause and effect relationships may be used to predict phenomena in natural systems.</p> <p><b><u>Structure and Function</u></b></p> <p>Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts; therefore complex natural structures/systems can be analyzed to determine how they function.</p> <p><b><u>Systems and System Models</u></b></p> <p>Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.</p> <p><b><u>Science is a Human Endeavor</u></b></p> <p>Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.</p>
<b>Science and engineering practices</b>	<p><b><u>Planning and carrying out investigations</u></b></p> <p>Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.</p> <p><b><u>Developing and Using Models</u></b></p> <p>Develop and use a model to describe phenomena.</p> <p><b><u>Engaging in Argument from Evidence</u></b></p> <p>Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.</p> <p><b><u>Obtaining, Evaluating, and Communicating Information</u></b></p> <p>Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.</p>

## Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary, to address needs of at risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments
- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusions

# Grade 7 Life Science 2021

Aligned to NJSLA 2020

## UNIT 2-Interactions, Energy, and Dynamic Relationships in Ecosystems

<p><b><u>Essential questions</u></b></p>	<p>How does the transformation of matter and energy link organisms in an ecosystem?</p>
<p><b><u>Disciplinary Core Ideas</u></b></p> <p><b>LS1.C: Organization for Matter and Energy Flow in Organisms</b></p> <p><b>LS2.A:Interdependent Relationships in Ecosystems</b></p>	<p><i>Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.</i></p> <p><i>Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.</i></p> <p><i>Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.</i></p> <p><i>In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.</i></p> <p><i>Growth of organisms and population increases are limited by access to resources.</i></p>
<p><b><u>Performance task</u></b></p> <p><b>MS-LS1-6.</b></p> <p><b><u>Performance task</u></b></p> <p><b>MS-LS1-7.</b></p>	<p><b>Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.</b></p> <ul style="list-style-type: none"> <li>Students will set up an investigation and collect data to track the reactants and products of photosynthesis</li> <li>Students will calculate the energy in food (Cheese puff)</li> <li>Students will construct an energy pyramid and trace the flow of energy from one trophic level to the next</li> </ul> <p><b>Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.</b></p> <ul style="list-style-type: none"> <li>Students will construct a physical model illustrating the rearrangement of reactant molecules in photosynthesis (<math>\text{CO}_2</math> and <math>\text{H}_2\text{O}</math>) to form the product molecules (<math>\text{C}_6\text{H}_{12}\text{O}_6</math> and <math>\text{O}_2</math>)</li> </ul>

	<ul style="list-style-type: none"> <li>Students will discover the relationship between photosynthesis and respiration and discover how energy stored for life functions during photosynthesis is released during respiration</li> </ul>
<b>MS-LS2-1.</b>	<p><b>Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.</b></p> <ul style="list-style-type: none"> <li>Students will learn that organisms with similar needs may compete with one another for available resources</li> <li>Students will identify and describe factors that could limit populations within an environment, such as disease, introduction of non-native species and depletion of resources</li> <li>Compare various biomes in terms of carrying capacity and limiting factors</li> <li>Predict future population patterns based on environmental change</li> </ul>
<b><u>Crosscutting concepts</u></b>	<p><b><u>Energy and Matter</u></b></p> <p>Within a natural system, the transfer of energy drives the motion and/or cycling of matter. Matter is conserved because atoms are conserved in physical and chemical processes.</p> <p><b><u>Cause and Effect</u></b></p> <p>Cause and effect relationships may be used to predict phenomena in natural or designed systems.</p>
<b><u>Science and engineering practices</u></b>	<p><b><u>Constructing Explanations and Designing Solutions</u></b></p> <p>Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.</p> <p><b><u>Developing and Using Models</u></b></p> <p>Develop a model to describe unobservable mechanisms.</p> <p><b><u>Analyzing and Interpreting Data</u></b></p> <p>Analyze and interpret data to provide evidence for phenomena.</p>

## Grade 7 Life Science 2021

Aligned to NJSLA 2020

### UNIT 3-Inheritance and Variation of traits

<p><b><u>Essential questions</u></b></p>	<p>How do living organisms pass traits from one generation to the next?</p> <p>What is the role of environment in natural and artificial selection of traits?</p> <p>How does technology influence the inheritance of desired traits in organisms?</p>
<p><b><u>Disciplinary Core Idea</u></b></p> <p><b>LS1.B:</b> <b>Growth and Development of Organisms</b></p> <p><b>LS4.B:</b> <b>Natural Selection</b></p>	<p><i>Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.</i></p> <p><i>Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.</i></p> <p><i>Genetic factors as well as local conditions affect the growth of the adult plant.</i></p> <p><i>In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)</i></p>
<p><b><u>Performance task</u></b></p> <p><b>MS-LS1-4.</b></p>	<p><b>Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized structures affect the probability of successful reproduction of animals and plants respectively</b></p> <ul style="list-style-type: none"> <li>• Investigate the co-evolution of plants and animals (pollinators)</li> <li>• Carry out "Plant pollinator project" during which students design a plant that will attract a designated pollinator, with particular attention to shape, color, plant markings etc.</li> <li>• Analyze scenarios about the evolution of long necks in giraffes by means of natural selection</li> </ul>
<p><b><u>Performance task</u></b></p> <p><b>MS-LS1-5.</b></p>	<p><b>Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</b></p> <p>_____</p> <p>_____</p> <p>_____</p>

<p><b><u>Performance task</u></b></p> <p><b>MS-LS4-5.</b></p>	<p><b>Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.</b></p> <ul style="list-style-type: none"> <li>• Students will investigate selective breeding of plants and animals to produce desirable traits and present an oral report on their findings</li> <li>• Students will investigate the use of genetic engineering and gene therapy for medical purposes (producing insulin and replacing “bad” genes)</li> <li>• Students will determine the advantages and disadvantages of GMO in food</li> </ul>
<p><b>Crosscutting concept</b></p>	<p><b>Cause and Effect</b> Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability</p> <p><b>Interdependence of Science, Engineering, and Technology</b> Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)</p> <p><b>Science Addresses Questions About the Natural and Material World</b> Science knowledge can describe consequences of actions but does not make the decisions that society takes. (MS-LS4-5)</p>
<p><b>Science and engineering practices</b></p>	<p><b>Engaging in Argument from Evidence</b> Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1-4)</p> <p><b>Constructing Explanations and Designing Solutions</b> Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students’ own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5)</p> <p><b>Obtaining, Evaluating, and Communicating Information</b> Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5)</p>

## Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary to address needs of at risk learners

# Grade 7 Life Science 2021

Aligned to NJSLA 2020

## Unit 4-Biological Evolution: Unity and Diversity

<b><u>Essential Questions</u></b>	How do organisms change over time in response to changes in the environment?
<b><u>Disciplinary Core Ideas</u></b>  <b>LS4.A: Evidence of Common Ancestry and Diversity</b>	<p><i>The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)</i></p> <p><i>Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)</i></p> <p><i>Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)</i></p>
<b>LS4.B: Natural Selection</b>	<p><i>Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)</i></p>
<b>LS4.C: Adaptation</b>	<p><i>Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not, become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)</i></p>

<b><u>Performance tasks</u></b>	
<b>MS-LS4-1.</b>	<p><b>Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.</b></p> <ul style="list-style-type: none"> <li>• Demonstrate the law of superposition using old newspapers and explain that the more recently deposited rock layers are likely to contain fossils resembling existing species</li> <li>• Students will use evidence in sedimentary rock layers to develop a model of the earth's geologic past.</li> <li>• Students will complete a web quest "What did T-rex taste like?" to investigate the evolutionary history of reptiles and birds.</li> </ul>
<b>MS-LS4-2.</b>	<p><b>Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships</b></p> <ul style="list-style-type: none"> <li>• Use anatomical diagrams of a human arm, a bird wing, a bat wing and the front flipper of a whale to outline similarities due to evolutionary relationships, and differences due to environmental adaptations.</li> </ul>
<b>MS-LS4-3.</b>	<p><b>Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy</b></p> <ul style="list-style-type: none"> <li>• Students will study pictures of embryos (Human, rabbit, bird and fish) and identify similarities in early development that show evolutionary relationships</li> </ul>
<b>MS-LS4-4</b>	<p><b>Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.</b></p> <ul style="list-style-type: none"> <li>• Students will recognize that adaptations in an organism may be structural, behavioral or physiological</li> <li>• Student will reason that adaptation and speciation involve the selection of natural variations in a population</li> <li>• Students will investigate adaptive radiation in the peppered moth population</li> </ul>



<p><b>Performance task</b> MS-LS4-6</p>	<p>Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time</p> <ul style="list-style-type: none"> <li>Students will engage in FOSS lab “Changes in walking stick bug population” to demonstrate how natural selection leads to changes in coloration of the population over 5 generations.</li> </ul>
<p><b>Crosscutting concepts</b></p>	<p><b>Patterns</b> Patterns can be used to identify cause and effect relationships. (MS-LS4-2) Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1), (MS-LS4-3)</p> <p><b>Cause and Effect</b> Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-6)</p> <p><b>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</b> Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2)</p>
<p><b>Science and engineering practices</b></p>	<p><b>Scientific Knowledge is Based on Empirical Evidence</b> Science knowledge is based upon logical and conceptual connections between evidence and explanations(MS-LS4-1)</p> <p><b>Analyzing and Interpreting Data</b> Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3) Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)</p> <p><b>Constructing Explanations and Designing Solutions</b> Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2)</p> <p><b>Using Mathematics and Computational Thinking</b> Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)</p>

## Unit Timeline/Map

Unit	Typical Timeline
<b>Molecules to Organisms</b>	<b>September - October</b>
<b>Interactions, Energy, Dynamics</b>	<b>November – January</b>
<b>Heredity</b>	<b>January – March</b>
<b>Science PS / Skills</b>	<b>Mid-April</b>
<b>Biological Evolution</b>	<b>April – June</b>

## Differentiation Strategies

1. Use of formulas in density and graphing lessons
2. Working with decimals and rounding when collecting data during investigations
3. Making predictions of outcomes before performing an investigation
4. Making measurements with rulers such as the size of granite pieces during weathering investigation
5. Distributions such as the distribution of fresh and salt water on the Earth
6. Collection and interpretation of data in most investigations such as the heating of various Earth materials
7. Use of variables such as time, distance, and mass when discussing erosion or gravity
8. Finding percentages when making circle graphs
9. Finding the volume of liquids and solids when finding density of materials
10. Use of positive and negative integers when discussing temperature
11. Use of fractions during graphing unit
12. Use of calculators to find density of liquids as well as the average granite size during weathering investigation
13. Finding elapsed time from sunrise and sunset times during seasons unit
14. Using proportions when comparing the size of celestial bodies
15. The idea of balancing when learning about air pressure, equilibrium, and wind formation
16. Making models of wind formation and habitable homes on other planets
17. Making designs/creating a plan when determining if air has mass

## **Interdisciplinary Connections**

1. Graphing Calculator Proficiency for use with Genetics and Ecology in Science Class
2. Simplifying / evaluating / solving equations for Ecology (population density and sampling) #7RP2C
3. Fractions and ratios to calculate concentration of solutions in studying cellular processes #7RP1
4. Probability for the study of genetics and inheritance patterns of diseases etc.
5. Estimation and sampling for population studies in ecology and evolution units
6. Metric conversions for measuring and calculation across units
7. Data collection and tables across all units
8. Interpreting graphs-Genetics, Ecology, Cells and cellular processes
9. Calculating percentage error during science experiments
10. Finding volume of cubes, cylinders and spheres
11. Mean, median, mode and range of data for Evolution and Ecology studies
12. Developing and using models to problem solve
13. Organizing and interpreting data
14. Constructing explanations and designing solutions
15. Identifying, extending, and formulating rules for patterns
16. Unit analysis (converting units within a given measurement system)

## **Instructional Materials**

<b>Grade Level</b>	<b>Title</b>	<b>Primary / Supplemental</b>
<b>Fifth – Eighth</b>	<b>Foss Modules &amp; Science Stories</b>	<b>Primary Leveled</b>
<b>Sixth</b>	<b>Earth Science: Prentice Hall '07</b>	<b>Primary Leveled</b>
<b>Seventh</b>	<b>Life Science : Prentice Hall '07</b>	<b>Primary Leveled</b>
<b>Eighth</b>	<b>Physical Science : Prentice Hall '07</b>	<b>Primary Leveled</b>

## **Career Readiness**

9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.

9.2.8.CAP.15: Present how the demand for certain skills, the job market, and credentials can determine an individual's earning power.

9.2.8.CAP.18: Explain how personal behavior, appearance, attitudes, and other choices may impact the job application process.

## **Life Literacies & Technology**

9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions

9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas

9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective

9.4.8.DC.1: Analyze the resource citations in online materials for proper use.

9.4.8.DC.3: Describe tradeoffs between allowing information to be public

9.4.8.DC.4: Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences

9.4.8.DC.6: Analyze online information to distinguish whether it is helpful or harmful to reputation.

9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.

9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.

9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping

9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations

9.4.8.IML.9: Distinguish between ethical and unethical uses of information and media

9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.

9.4.8.IML.13: Identify the impact of the creator on the content, production, and delivery of information

9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

9.4.8.TL.5: Compare the process and effectiveness of synchronous collaboration and asynchronous collaboration.

9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem

# Grade 8 Physical Science 2021

Aligned to NJSLA 2020

## Unit 1 Matter and its Interactions

<b><u>Essential Questions</u></b>	<p>How do atomic and molecular interactions explain the properties of matter that we see and feel?</p> <p>How does the organization of the periodic table explain the relationships between elements?</p> <p>How can particles combine to produce a different substance with different properties?</p> <p>What happens at a molecular level in each state of matter and when matter changes between states?</p> <p>How can energy be transferred from one object or system to another?</p>
<b><u>Disciplinary Core Ideas</u></b>  <b>PS1.A:</b>  <b>Structure and Properties of Matter</b>	<ul style="list-style-type: none"><li>○ <i>Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)</i></li><li>○ <i>Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3) (MS-PS1-2)</i></li><li>○ <i>Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)</i></li><li>○ <i>In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)</i></li><li>○ <i>Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals) (MS-PS1-1)</i></li><li>○ <i>The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4)</i></li></ul>

<p><b>PS1.B: Chemical Reactions</b></p>	<ul style="list-style-type: none"> <li>○ <i>Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3),(MS-PS1-5)</i></li> <li>○ <i>The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5)</i></li> <li>○ <i>Some chemical reactions release energy, others store energy. (MS-PS1-6)</i></li> </ul>
<p><b>PS3.A: Definitions of Energy</b></p>	<ul style="list-style-type: none"> <li>○ <i>The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4)</i></li> <li>○ <i>The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4)</i></li> </ul>
<p><b>ETS1.B: Developing Possible Solutions</b></p>	<ul style="list-style-type: none"> <li>○ <i>A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (secondary MS-PS1-6)</i></li> </ul>
<p><b>ETS1.C: Optimizing the Design Solution</b></p>	<ul style="list-style-type: none"> <li>○ <i>Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. (secondary to MS-PS1-6)</i></li> <li>○ <i>The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (secondary to MS-PS1-6)</i></li> </ul>

<b><u>Performance tasks</u></b>	
MS-PS1-1.	<p><b>Develop models to describe the atomic composition of simple molecules and extended structures.</b></p> <ul style="list-style-type: none"> <li>▪ Complete computer simulation to build an atom and a molecule.</li> <li>▪ Use ball and stick manipulates to represent different element and compounds.</li> <li>▪ Students will create models of atoms and determine the atoms' relative masses.</li> <li>▪ Students will investigate the structure and arrangement of the periodic table by completing the "Allen Periodic Table Activity"</li> <li>▪ Analyze and draw conclusions from materials examined to develop and explain a scheme for classifying matter.</li> <li>▪ Students will learn to distinguish mixtures, compounds and solutions as they separate mixtures of ink and cosmetics using chromatography.</li> </ul>
MS-PS1-3.	<p><b>Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.</b></p> <ul style="list-style-type: none"> <li>▪ Students will learn about the formation and effects of trans fats on the body. They will demonstrate an understanding of the trans fats debate and engage in hands-on activities to identify common use for trans fats and alternative food substitutes.</li> <li>▪ Students will investigate how the development of plastics and the engineering of plastics into everyday products have impacted the world.</li> </ul>
MS-PS1-4.	<p><b>Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.</b></p> <ul style="list-style-type: none"> <li>▪ Students will investigate the macroscopic properties of a gas and develop a particulate model to describe the invisible composition and interactions that account for the observable behaviors of a gas.</li> <li>▪ Students will observe expansion and contraction of solids, liquids and gases and explain the phenomena in terms of the kinetic theory.</li> <li>▪ Students will experience the effects of energy transfer and learn to conceptualize the process of energy transfer as changes of particle kinetic energy result from particle collisions when completing the "Energy on the Move" activity.</li> <li>▪ Students will experiment with the three common phases of matter and investigate the conditions that induce substance to change from one phase to another.</li> <li>▪ Students will identify and control variables to design an experiment to see whether the temperature of a solvent affects the speed at which a solute dissolves.</li> </ul>

MS-PS1-2.	<p><b>Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.</b></p> <ul style="list-style-type: none"> <li>▪ Create a model to explain what happens to chemical bonds during a chemical reaction.</li> <li>▪ Students will investigate the signs of chemical reactions.</li> <li>▪ Illustrate how chemical reactions produce new substances that have different chemical and physical properties.</li> <li>▪ Represent chemical changes with word equations and/or balanced chemical equations.</li> <li>▪ Interpret and differentiate between balanced and unbalanced chemical equations.</li> <li>▪ Design an experiment to evaluate factors that affect the rate of a chemical reaction.</li> </ul>
MS-PS1-5.	<p><b>Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.</b></p> <ul style="list-style-type: none"> <li>▪ Students will design and implement an experiment to verify the Law of Conservation of Mass is upheld in both physical and chemical changes.</li> <li>▪ Relate a balanced chemical equation to the Law of Conservation of Mass.</li> </ul>
MS-PS1-6.	<p><b>Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.</b></p> <ul style="list-style-type: none"> <li>▪ Students are presented with the problem of using a chemical reaction to create a device to incubate snake eggs at a specific temperature. Students discuss the specifications or criteria for the device as well as the limitations of the materials and chemical process, or constraints. Students learn to test, measure, and analyze their results in order to refine the reaction. They also learn how to take different factors into consideration as they optimize the design.</li> <li>▪ After discovering a combination of reactants that produces the required temperature range, students need to consider how to insulate the device against excessive heat loss through heat transfer. Students consider using a Styrofoam cup or wrapping the cup with an insulating material. They may also consider designing a lid to reduce loss of heat through heat transfer.</li> </ul>



<p><b>Crosscutting concepts</b></p>	<p><b>Cause and Effect</b> Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-PS1-4)</p> <p><b>Scale, Proportion, and Quantity</b> Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)</p> <p><b>Structure and Function</b> Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)</p> <p><b>Patterns</b> Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-2)</p> <p><b>Energy and Matter</b> Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5)</p> <p>The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6)</p>
<p><b>Science and engineering practices</b></p>	<p><b>Developing and Using Models</b> Develop a model to predict and/or describe phenomena. (MS-PS1-1), (MS-PS1-4)</p> <p><b>Obtaining, Evaluating, and Communicating Information</b> Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-PS1-3)</p> <p><b>Analyzing and Interpreting Data</b> Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2)</p> <p><b>Constructing Explanations and Designing Solutions</b> Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)</p>

# Grade 8 Physical Science 2021

Aligned to NJSLA 2020

## Unit 2 Motion and Stability: Forces and Interactions

<b><u>Essential Questions</u></b>	<p>How is motion defined and measured?</p> <p>What factors affect the motion of an object?</p> <p>How can one describe physical interactions between objects and within a system of objects?</p> <p>How can you use Newton's laws to understand and predict the movement of an object?</p>
<b><u>Disciplinary Core Ideas</u></b>  <b>PS2.A: Forces and Motion</b>          <b>PS2.B: Types of Interactions</b>	<ul style="list-style-type: none"><li>○ <i>For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1)</i></li><li>○ <i>The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)</i></li><li>○ <i>All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2)</i></li><li>○ <i>Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)</i></li><li>○ <i>Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4)</i></li><li>○ <i>Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (MS-PS2-5)</i></li></ul>

<p><b><u>Performance tasks</u></b></p> <p>MS-PS2-1.</p>	<p><b>Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.</b></p> <ul style="list-style-type: none"> <li>▪ Identify action/reaction pairs.</li> <li>▪ Observe a demonstration of Hero's Engine to draw and explain simplified free-body diagrams showing action/reaction pairs.</li> <li>▪ Students will design and construct a self-propelled car to examine how forces are used to move objects.</li> </ul>
<p>MS-PS2-2.</p>	<p><b>Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.</b></p> <ul style="list-style-type: none"> <li>▪ Students will investigate what force is and how it is measured.</li> <li>▪ Students will construct a zip line to recognize and analyze the motion (and cause of motion) of an object. Students will evaluate the causes of motion and deduce the important factors in measuring motion (time and distance)</li> <li>▪ Students will determine how to calculate net force and the effect of motion caused by balanced and unbalanced forces.</li> <li>▪ Students will investigate how mass affects the acceleration of an object by designing and testing a "bumper boat" of with different masses.</li> </ul>
<p>MS-PS2-3.</p>	<p><b>Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.</b></p> <ul style="list-style-type: none"> <li>▪ Students will determine the effects caused by a magnet and how to test for the presence of a magnet or magnetic field.</li> <li>▪ Using supplies and materials given by the teacher, the students will design, test and build the strongest electromagnet with the lowest mass.</li> <li>▪ Students will design and test a conceptual model to explore how magnetic potential energy can be used as a fossil-fuel free alternative to train transportation.</li> </ul>
<p>MS-PS2-4.</p>	<p><b>Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.</b></p> <ul style="list-style-type: none"> <li>▪ Students will investigate the difference between mass and weight by collecting data and creating a graphical representation of each variable to draw an accurate conclusion.</li> <li>▪ Use a "picket fence" to investigate and determine the mathematical value for "g".</li> <li>▪ Students will devise a plan to investigate objects dropped at rest with acceleration at the same speed and the time they each hit the ground.</li> <li>▪ Create an illustration that accurately demonstrates two objects with varying masses falling and hitting the ground and mathematically prove the results of the illustration.</li> <li>▪ Students will find examples of parachutes used in nature for seed dispersal. Draw a force diagram of the object from nature and how air drag is used to slow the objects' fall to Earth.</li> </ul>

MS-PS2-5.	<p><b>Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.</b></p> <ul style="list-style-type: none"> <li>▪ Students will observe and explore various kinds of forces and identify each as contact or noncontact and the affects each has on the agent and receiver.</li> <li>▪ Students will complete the "Air Swimmers" activity to identify buoyant force, its effects on floating objects and how it can be used to calculate the weight of the object.</li> <li>▪ Students will design and construct a magnetic compass to use as a navigation aid.</li> </ul>
Crosscutting concepts	<p><b>Cause and Effect</b> Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-PS2-3),(MS-PS2-5)</p> <p><b>Systems and System Models</b> Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS2-1),(MS-PS2-4),</p> <p><b>Stability and Change</b> Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2)</p>
Science and engineering practices	<p><b>Asking Questions and Defining Problems</b> Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. (MS-PS2-3)</p> <p><b>Planning and Carrying Out Investigations</b> Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS2-2)</p> <p>Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. (MS-PS2-5)</p> <p><b>Constructing Explanations and Designing Solutions</b> Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing</p>

	<p>solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.</p> <p>Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1)</p> <p><b>Engaging in Argument from Evidence</b></p> <p>Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-PS2-4)</p>
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## **Grade 8 Physical Science 2021**

### **Unit 3 Energy**

<b><u>Essential Questions</u></b>	What is energy and how can it be transferred and conserved? What is the difference between potential and kinetic energy? How does the energy transfer from one object or system to another affect the interactions of those objects or systems?
<b><u>Disciplinary Core Ideas</u></b>	
<b>PS3.A: Definitions of Energy</b>	<ul style="list-style-type: none"> <li>○ Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)</li> <li>○ A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)</li> <li>○ Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4)</li> </ul>
<b>PS3.B: Conservation of Energy and Energy Transfer</b>	<ul style="list-style-type: none"> <li>○ When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)</li> <li>○ The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4)</li> <li>○ Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)</li> </ul>
<b>PS3.C: Relationship Between Energy and Forces</b>	<ul style="list-style-type: none"> <li>○ When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)</li> </ul>
<b>ETS1.A: Defining and Delimiting an Engineering Problem</b>	<ul style="list-style-type: none"> <li>○ The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary to MS-PS3-3)</li> </ul>
<b>ETS1.B: Developing Possible Solutions</b>	<ul style="list-style-type: none"> <li>○ A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3)</li> </ul>
<b><u>Performance tasks</u></b>	
<b>MS-PS3-1.</b>	<p><b>Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.</b></p> <ul style="list-style-type: none"> <li>▪ Students will investigate energy, its forms and how it can be calculated.</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Students will use a pHet simulation to push common objects of varying masses up an inclined plane to explore the relationship between applied force, work and energy.</li> <li>▪ Students will complete a “washer” activity to investigate how mass affects velocity when kinetic energy remains constant.</li> </ul>
MS-PS3-2.	<p><b>Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.</b></p> <ul style="list-style-type: none"> <li>▪ Students will observe and record amount of work done by three different marbles rolling down an inclined plane and hypothesize about reasons for the differences.</li> <li>▪ Students will investigate how potential energy can change into kinetic energy by swinging a pendulum, illustrating the concept of conservation of energy. Students calculate the potential energy of the pendulum and predict how fast it will travel knowing that the potential energy will convert into kinetic energy. They verify their predictions by measuring the speed of the pendulum.</li> <li>▪ Students drop water from different heights to demonstrate the conversion of water's potential energy to kinetic energy. They see how varying the height from which water is dropped affects the splash size. They follow good experiment protocol, take measurements, calculate averages and graph results.</li> </ul>
MS-PS3-3.	<p><b>Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer</b></p> <ul style="list-style-type: none"> <li>▪ Calculate the R-value of different materials given data on the rate of heating/cooling across the material.</li> <li>▪ Build a model house out of cardboard, using cellophane for windows and a light bulb for the heat source to explore the rate of heating and cooling under different conditions of insulation.</li> <li>▪ Construct an insulator that is designed to retain heat.</li> </ul>
MS-PS3-4.	<p><b>Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.</b></p> <ul style="list-style-type: none"> <li>▪ Students will investigate the three methods of heat transfer using Crisco and different rods as they observe heat travels through solids at different rates.</li> <li>▪ Student will determine the amount of calories transferred when hot water and cold water mix. They will explain energy transfer in change of particle kinetic resulting from collision.</li> <li>▪ Students will build a thermometer and explain how it works in terms of expansion, contraction and kinetic energy on a molecular level.</li> </ul>
MS-PS3-5.	<p><b>Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.</b></p> <ul style="list-style-type: none"> <li>▪ Describe friction and identify the factors that determine the friction force between two surfaces.</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Identify and describe the different forms of energy.</li> <li>▪ Students will engage in an activity showing energy conversion, and how energy transfers from one form, place or object to another. They learn that energy transfers can take the form of force, electricity, light, heat and sound and are never without some energy "loss" during the process. Two real-world examples of engineered systems—light bulbs and cars—are examined in light of the law of conservation of energy to gain an understanding of their energy conversions and inefficiencies/losses.</li> <li>▪ Design and evaluate solutions that minimize and/or maximize friction and energy transfer in everyday machines.</li> </ul>
<b>Crosscutting concepts</b>	<p><b>Scale, Proportion, and Quantity</b> Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-4)</p> <p><b>Systems and System Models</b> Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems. (MS-PS3-2)</p> <p><b>Energy and Matter</b> Energy may take different forms (e.g., energy in fields, thermal energy, energy of motion). (MS-PS3-5)</p> <p>The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS3-3)</p>
<b>Science and engineering practices</b>	<p><b>Developing and Using Models</b> Develop a model to describe unobservable mechanisms. (MS-PS3-2)</p> <p><b>Planning and Carrying Out Investigations</b> Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS3-4)</p> <p><b>Analyzing and Interpreting Data</b> Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1)</p> <p><b>Constructing Explanations and Designing Solutions</b> Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. (MS-PS3-3)</p>



	<b>Engaging in Argument from Evidence</b>  Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. (MS-PS3-5)
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# Grade 8 Physical Science 2021

**Aligned to NJSLA 2020**

## Unit 4 Waves and Electromagnetic Radiation

[illegible]

	<p><b>energy in a wave.</b></p> <ul style="list-style-type: none"> <li>▪ Students will use a motion detector to describe (verbally, graphically, and mathematically) the motion of a mass on the end of a spring.</li> <li>▪ Complete pHet on a string simulation to describe and identify the fundamental properties of waves.</li> <li>▪ Students will engage in a learning activity that focuses on the basics of the electromagnetic spectrum and how various types of electromagnetic waves are related in terms of wavelength and energy. In addition, they are introduced to the various types of waves that make up the electromagnetic spectrum including, radio waves, ultraviolet waves, visible light and infrared waves. Comparisons of all EM waves in terms of their energy and wavelengths will be made.</li> </ul>
MS-PS4-2.	<p><b>Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.</b></p> <ul style="list-style-type: none"> <li>▪ Students will explore how sound waves move through liquids, solids and gases in a series of simple sound energy experiments.</li> <li>▪ In a hands-on way, students explore light's properties of absorption, reflection, transmission and refraction through various experimental stations within the classroom. To understand absorption, reflection and transmission, they shine flashlights on a number of provided objects. To understand refraction, students create indoor rainbows.</li> <li>▪ Students make simple spectroscopes (prisms) to look at different light sources. The spectroscopes allow students to see differing spectral distributions of different light sources. Students also shine a light source through different materials with varying properties and compare the differences</li> </ul>
MS-PS4-3.	<p><b>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.</b></p> <ul style="list-style-type: none"> <li>▪ Students will research and apply scientific knowledge to explain the application of waves in common communication designs and devices.</li> </ul>
<b>Crosscutting concepts</b>	<p><b>Patterns</b></p> <p>Graphs and charts can be used to identify patterns in data. (MS-PS4-1)</p> <p><b>Structure and Function</b></p> <p>Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS4-2)</p> <p>Structures can be designed to serve particular functions. (MS-PS4-3)</p>

<b>Science and engineering practices</b>	<p><b>Developing and Using Models</b></p> <p>Develop and use a model to describe phenomena. (MS-PS4-2)</p> <p><b>Using Mathematics and Computational Thinking</b></p> <p>Use mathematical representations to describe and/or support scientific conclusions and design solutions. (MS-PS4-1)</p> <p><b>Obtaining, Evaluating, and Communicating Information</b></p> <p>Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. (MS-PS4-3)</p>
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## Unit Timeline/Map

Unit	Typical Timeline
Properties of Matter	September - December
Motion / Forces	January – February
Energy	March – April
Science PS / Skills	Mid-April
Waves	April – June

## Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary, to address needs of at risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments

- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusion
- Allow for extended time on homework and assessments as described in the student's plan
- Allow use of calculator
- Check for comprehension and understanding
- Highlight or underline key words
- Permit ample time for student to respond to questions
- Clearly define limits and expectations
- Encourage student to ask for needed assistance
- Preferential seating
- Repeating, clarifying or rewording directions
- Allow for alternate responses
- Provide student with advanced notes
- Allow for extended time on homework and assessments
- Teacher modeling of what is expected and necessary steps to complete task
- Provide simplified written and verbal instructions
- Permit ample time for student to respond to questions
- Repeating, clarifying or rewording directions
- Allow use of eDictionary/technology to look up unknown words

## **Science 8**

### ***Interdisciplinary Connections***

1. Graphing calculator proficiency for use with radar in science class
2. Simplifying / evaluating / solving equations for chemistry and physical science #8EE7&8
3. Understanding velocity and acceleration formulas for balloon car challenge. #8G9 #8EE2
4. Calculating slope of a line to determine speed and acceleration
5. Distributive property, coefficient, subscript, and least common multiple to balance equations
6. Interpreting independent and dependent variables to create a table and a graph
7. Interpreting line graphs in speed and acceleration
8. Using formulas to solve problems
9. Creating a scatter plot and drawing in a line of best fit to analyze data in force and motion
10. Dimensional analysis to convert units (eg meters/sec to centimeters/minute) to compare speeds
11. Interpreting rate in physical science
12. Proportional relationships (direct or inverse) in density and frequency and wavelength
13. Scientific notation in Ph and radioactive decay
14. Ratios in chemical formulas
15. Measurements (volume, mass, length, area)

## Instructional Materials

Grade Level	Title	Primary / Supplemental
Fifth – Eighth	Foss Modules & Science Stories	Primary Leveled
Sixth	Earth Science: Prentice Hall '07	Primary Leveled
Seventh	Life Science : Prentice Hall '07	Primary Leveled
Eighth	Physical Science : Prentice Hall '07	Primary Leveled

## Career Readiness

9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.

## Life Literacies & Technology

9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions

9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option

9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome

9.4.8.DC.4: Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences.

9.4.8.DC.5: Manage digital identity and practice positive online behavior to avoid inappropriate forms of self-disclosure

9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change

9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.

9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.

9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping

9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.

9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data.

9.4.8.IML.13: Identify the impact of the creator on the content, production, and delivery of information

9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making. 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

**2021 Science 5-8**  
**NJSLA ANCHOR**  
**STANDARDS**

Every Student Every Day



**History, Social Studies, Science and Technical Subjects  
Grades 6-8**

**Anchor Standards for Reading**

**Key Ideas and Details**

NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

NJSLSA.R2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

NJSLSA.R3. Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

**Craft and Structure**

NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

NJSLSA.R5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

NJSLSA.R6. Assess how point of view or purpose shapes the content and style of a text.

**Integration of Knowledge and Ideas**

NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

NJSLSA.R8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

NJSLSA.R9. Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.

## **Note on range and content of student reading**

To become college and career ready, students must grapple with works of exceptional craft and thought whose range extends across genres, cultures, and centuries. Such works offer profound insights into the human condition and serve as models for students' own thinking and writing. Along with high-quality contemporary works, these texts should be chosen from among seminal U.S. documents, the classics of American literature, and the timeless dramas of Shakespeare. Through wide and deep reading of literature and literary nonfiction of steadily increasing sophistication, students gain a reservoir of literary and cultural knowledge, references, and images; the ability to evaluate intricate arguments; and the capacity to surmount the challenges posed by complex texts.

## **Grades 6-8**

### **Progress Indicators Reading History**

#### **Reading History and Social Studies**

The standards below begin at grade 6; standards for K-5 reading in history/social studies, science, and technical subjects are integrated into the K-5 Reading standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

#### **Key Ideas and Details**

RH.6-8.1. Cite specific textual evidence to support analysis of primary and secondary sources.

RH.6-8.2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.

RH.6-8.3. Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).

#### **Craft and Structure**

RH.6-8.4. Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.

RH.6-8.5. Describe how a text presents information (e.g., sequentially, comparatively, causally).

RH.6-8.6. Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).

#### **Integration of Knowledge and Ideas**

RH.6-8.7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

RH.6-8.8. Distinguish among fact, opinion, and reasoned judgment in a text.

RH.6-8.9. Analyze the relationship between a primary and secondary source on the same topic.

New Jersey Student Learning Standards for English Language Arts  
Companion Standards

**Range of Reading and Level of Text Complexity**

RH.6-8.10. By the end of grade 8, read and comprehend history/social studies texts in the grades 6-8 text complexity band independently and proficiently.

**Grades 6-8**

**Progress Indicators Reading Science and Technical Subjects**

**Key Ideas and Details**

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

**Craft and Structure**

RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.

RST.6-8.5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

RST.6-8.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

**Integration of Knowledge and Ideas**

RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

**Range of Reading and Level of Text Complexity**

RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

## **Anchor Standards for Writing**

### **Text Types and Purposes**

NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

NJSLSA.W3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

### **Production and Distribution of Writing**

NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

NJSLSA.W5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

### **Research to Build and Present Knowledge**

NJSLSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.

NJSLSA.W8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

NJSLSA.W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

### **Range of Writing**

NJSLSA.W10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

### **Note on range and content in student writing**

To build a foundation for college and career readiness, students need to learn to use writing as a way of offering and supporting opinions, demonstrating understanding of the subjects they are studying, and conveying real and imagined experiences and events. They learn to appreciate that a key purpose of writing is to communicate clearly to an external, sometimes unfamiliar audience, and they begin to adapt the form and content of their writing to accomplish a particular task and purpose. They develop the capacity to build knowledge on a subject through research projects and to respond analytically to literary and informational sources. To meet these goals, students must devote significant time and effort to writing, producing numerous pieces over short and extended time frames throughout the year.

### **Grades 6-8**

#### **Progress Indicators for Writing History, Science and Technical Subjects**

The standards below begin at grade 6; standards for K-5 writing in history/social studies, science, and technical subjects are integrated into the K-5 writing standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

#### **Text Types and Purposes**

WHST.6-8.1. Write arguments focused on *discipline-specific content*.

- A. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- B. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- C. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- D. Establish and maintain a formal/academic style, approach, and form.
- E. Provide a concluding statement or section that follows from and supports the argument presented.

WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- A. Introduce a topic and organize ideas, concepts, and information using text structures (e.g. definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g. headings, graphics, and multimedia) when useful to aiding comprehension.
- B. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- C. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- D. Use precise language and domain-specific vocabulary to inform about or explain the topic.
- E. Establish and maintain a formal/academic style, approach, and form.
- F. Provide a concluding statement or section that follows from and supports the information or explanation presented.

WHST.6-8.3

(See note; not applicable as a separate requirement)

**Production and Distribution of Writing**

WHST.6-8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.

WHST.6-8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

**Research to Build and Present Knowledge**

WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

WHST.6-8.9. Draw evidence from informational texts to support analysis, reflection, and research.

**Range of Writing**

WHST.6-8.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

**Note**

Students' narrative skills continue to grow in these grades. The standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work so that others can replicate them and (possibly) reach the same results.

# **2021 Science 5-8**

## **Sample STEM Units**

**The following are examples of STEM units that are  
completed throughout the school year.**

**Every Student Every Day**



## **Grade 5 Science: Variables**

### **Choosing Your Own Investigation**

#### **Unit Summary**

Some of the most important scientific concepts students learn are the result of their ability to see relationships between objects and events. Relationships always involve interactions, dependencies, and cause and effect. Through the four investigations in the Variables Module students discover relationships through controlled experimentation. At the end of the unit students will design and carry out their own controlled experiment to investigate consumer products, toys, or any of the systems previously explored (pendulums, boats, planes, or catapults.) Students will work in groups of two to five collecting, graphing, and presenting data in a Power Point presentation to their peers.

#### **Standards Alignment**

ETS1.B: Developing Possible Solutions

3-5-ETS1-2 - At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.

3-5-ETS1-3 - Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

#### **Curriculum-Framing Questions**

Essential Question

- What is the relationship between your Independent Variable and your Dependent Variable?

Unit Questions

- Describe your system. Why is it called a system?
- Why is it important to control your variables?
- Why do scientists conduct multiple trials of the same variable?

Content Questions

- What is a variable?

- What is a standard?
- How can a two-coordinate graph be used to make predictions?

## Assessment Processes

- Student Project Proposal – Student and teacher determine the content. Look for students to plan a logical investigation and have a reasonable plan on the topic to be presented to the class.
- Teacher Observation: Independent Investigating – Look for student to work independently and with their group to complete an investigation
- Presentation Rubric:

### Presentation Score Sheet – Variables Unit

3 – Successfully presented      2 – Presented      1 – Partially presented      0 – Not presented

\_\_\_\_\_ Identifies what your group was trying to find out

\_\_\_\_\_ Discusses materials needed for the project

\_\_\_\_\_ Discusses the procedure needed to complete the project

\_\_\_\_\_ Identifies what was learned from doing the project

\_\_\_\_\_ Completed graph

\_\_\_\_\_ Student uses a clear voice and maintains good eye contact

\_\_\_\_\_ Overall visual aid

\_\_\_\_\_ Presentation is between 2 ½ and 3 ½ minutes long

## Instructional Procedures

- Introduce the Project – students have been completing controlled experiments throughout the unit in anticipation of creating and completing one of their very own. Review *Project Ideas* sheet to stimulate thoughts and ideas for a topic to be investigated.
- Collect Information and Create Proposals – All students will complete the *Project Proposal* sheet: Identify the variable they will investigate, write the steps they will follow in their controlled experiment, and decide how they will organize their results. Students will be placed in groups of two to five based on their interests.

- Conduct controlled experiments – Student groups work as independently as possible to complete their experiments. Students will collect data and graph results on a two-coordinate graph.
- Present Findings – Students complete a power point presentation adhering to the *Presentation Guidelines* sheet and *Presentation Rubric*.

## **Prerequisite Skills**

Students will have completed four investigation within the FOSS Variables Unit

- The Learner Will Be Able to observe and compare the behavior of pendulums. Students build and observe standard pendulums made from string and pennies. They will identify possible variables that could affect the number of swings the pendulum makes in 15 seconds.
- The Learner Will Be Able to experiment to find out what variables affect the number of cycles a pendulum makes in a unit of time.
- TLWBA to predict the behavior of new pendulums, using a graph.
- The Learner Will Be Able to identify what variables affect how much mass a boat can hold before sinking.
- TLWBA to use a two-coordinate graph to predict the number of passengers different size boats can hold.
- The Learner Will Be Able To identify all the parts of the model plane as a system.
- Students will be able to relate the effects of variables to the distance their FOSS plane travels.
- The Learner Will Be Able To conduct controlled experiments, by testing the effects of other variables on their plane system.
- TLWBA to create a two-coordinate graph and predict outcomes of plane flights.
- TLWBA to identify the parts of a flipper system.
- TLWBA to identify variables as something that can change in an experiment that might affect the outcome.
- TLWBA to conduct multiple trial of an experiment to gain greater accuracy for results.
- Students will plot results of their controlled experiment on a two- coordinate graph. They will present their graph and describe the relationship between the experimental variable and the outcome

## **Credits**

Full Option Science System- Variables Unit – Delta Education

## MTMS 6<sup>th</sup> Grade Earth Science STEM Unit

### **Planets in Our Solar System**

#### **Unit Summary**

After achieving an in-depth understanding of the Earth's motion in space, Earth's moon, its role in tides and eclipses, and the life cycle of stars, students will focus on the presence of other objects in our solar system and their relationship to one another. In this unit, students will be engaged in a research and engineering project focused on one of the planets in our solar system. They will imagine that Earth has become uninhabitable and then work in cooperative teams to persuade their audience to purchase real estate on a specific planet assigned to them. Groups will research their planet, create a presentation using google slides, and design a model of a home that can (in theory) sustain life on their planet.

#### **Standards Alignment**

This unit is aligned to Common Core State Standards and Next Generation Science Standards.

- **SCI.5-6.5.4.6.A.d** - The Sun is the central and most massive body in our solar system, which includes eight planets and their moons, dwarf planets, asteroids, and comets.
- **SCI.5-6.5.4.6.A.4** - Compare and contrast the major physical characteristics (including size and scale) of solar system objects using evidence in the form of data tables and photographs.
- **SCI.MS-ESS1-3** - Analyze and interpret data to determine scale properties of objects in the solar system.

#### **Curriculum-Framing Questions**

- **Essential Question**  
Besides Earth, what are the other planets in our solar system, and what are their properties and characteristics?
- **Unit Questions**  
What is the history of your planet, and has there been explorations of your planet?  
What are the measurements, appearance, and composition of your planet?  
What are the atmosphere and surface conditions of your planet?  
How habitable is your planets and what modifications must be made to live on your planet?  
Would your model support life on your planet?
- **Content Questions**  
What are the 8 planets in our solar system and their position in relation to one another?  
What are the components and properties of each planet?

#### **Assessment Processes**

- Students will be assessed their research, model, and presentation, using the attached rubric.
- Students will be given the rubric at the beginning of this unit in order to self-assess and prepare throughout the project.

#### **Instructional Procedures**

##### **Introduce the project**

Review the following with the class:

After months of training and the successful completion of your real estate exam, you have recently been hired as a realtor for the SolarSys Realty Company LLC. Although you are new

to the job, your company has decided to put you in charge of one of the largest real estate ventures ever taken on. Since the Earth has become very overcrowded, your company has started to explore other planets and their habitability. You need to convince people to move to a planet other than Earth. Basically, you need to persuade them to purchase a plot of land on your assigned planet. This task will require you and your associate(s) to:

- Research your assigned planet (data collection charts attached)
- Create a persuasive Google Slides presentation that attempts to "sell" the planet. This will highlight information from the data collection charts attached.
- Use your research to design and create a model of a house on your planet
- Present your Google Slides presentation and model to the class (your potential buyers)

### **Research, Create Presentation, Design and Create Model**

Have students follow the following guidelines:

1. First complete the attached data collection charts. Evenly divide up the pages and put your name on the page(s) you complete. You will need to use multiple sources to complete all of your research. You can use the websites on the next page for your research.
2. Once all of the research is complete, use the Google Slides template to create your presentation. Have one person create the presentation and then share the presentation with the other group members so they can add their slides. You must include all the requirements on the template. After the Title slide, you need at least 9 slides like the template, but you can definitely add more! On each slide that you make, put your name in the bottom right corner of the slide. Be creative! Have fun!
  - a. If you are a group of two, one person needs to make at least 4 slides and the other person needs to make at least 5 slides.
  - b. If you are a group of three, each person needs to make at least 3 slides each.
  - c. If you are a group of four, each person needs to make at least 2 slides and one person needs to make at least 3 slides.
3. Once your presentation is completed, share your presentation online with Mr. Viggiano (mviggiano@medhamtwp.org) and then practice as a group so you are ready to present to the class.
4. Use your research to design and create a three dimensional model of a habitable home on your planet.

### **Presentations**

Have groups pitch their planet by presenting their research and model home. Collect research and models to be assessed using the rubric.

### **Prerequisite Skills**

- Basic research skills
- Basic understanding of how to use google slides
- Completion of the following objectives in planetary science:
  - Describe the features of the moon and explain the reason for craters on the moon
  - Identify and describe the phases of the moon and why we have them

- Explain lunar and solar eclipses
- Explain how the moon affects the tides
- Explain the universal law of gravity
- Describe what a star is and the life cycle of a star
- Describe the history of specific constellations and the stars they are composed of
- Describe the objects in our solar system as well as the distance between them
- Explain the Big Bang Theory
- Describe heliocentrism

### **Credits**

- <http://msascienceonline.weebly.com/planet-project.html>
- [http://www.sciencewithmrjones.com/downloads/astronomy/solar\\_system/planet\\_presentation.pdf](http://www.sciencewithmrjones.com/downloads/astronomy/solar_system/planet_presentation.pdf)

Name \_\_\_\_\_

Per. \_\_\_\_\_

**Planet Research Project Rubric**

Category	4	3	2	1	0
<b>Research Charts</b>	Evenly divided research thoroughly, accurately, and neatly completed. Thoughtful and detailed answers when needed.	Evenly divided research complete but could be more thorough and all or mostly accurate information. Some answers could be more thoughtful and detailed.	Research may not have been evenly divided. Some parts of research may be incomplete. Parts of research are inaccurate or may require more thought, details, or effort. Parts are messy or unorganized.	Research not evenly divided. Some parts of research incomplete. Much of the research is inaccurate and requires more thought, details, or effort. Parts are messy or unorganized.	Most of research is incomplete, inaccurate, and shows no effort.
<b>Google Slides</b>	Thoroughly completed required or more than required slides. Slides are organized, colorful, and attractive. Information is not copy and pasted. Good captions on pictures when required.	Required number of slides are completed, but may be missing some requirements or could have more information and details. Some captions on pictures could be more detailed. Slides could be a little more colorful and organized. Information is not copy and pasted.	May not have the required amount of slides completed or some requirements on slides are missing or need more information and details. Captions on pictures are poor and slides are not very attractive and organized. Some information may be copy and pasted.	Do not have required number of slides completed or many of the requirements are missing or need much more information. Captions are poor or missing. Slides have no color and are unorganized. A lot of information may be copy and pasted.	Slides are missing and most of the requirements are missing or need much more information. No caption on pictures. No color and unorganized. Most of the information is copy and pasted.
<b>Presentation</b>	Good eye contact. Clear voice and good volume for all to hear. Enthusiastic. Not reading from slides. Talking about the information instead of reading it. Information not completely memorized but shows practice.	Mostly good eye contact. Voice could be clearer or better volume. Mostly enthusiastic. May read from slides occasionally. Could be more familiar with information and practiced a little more.	Fair eye contact. Voice was not always clear or at a good volume. Not very enthusiastic. Read from slides many times. Not very familiar with information and more practice needed.	Poor eye contact. Voice was not clear or at a good volume. No enthusiasm. Mostly read from slides. Not familiar with information. Little to no practice evident.	No eye contact. Voice unclear and very hard to hear. No enthusiasm. Read entirely from the slides. Unfamiliar with information and no practice evident.
<b>Models</b>	Model shows great amount of effort and detail. Model incorporates all modifications needed for humans to live on assigned planet. Model is very creative.	Model shows much effort and detail. Model incorporates most modifications needed for humans to live on assigned planet. Model shows creativity.	Model shows effort and detail. Model incorporates many modifications needed for humans to live on assigned planet.	Model shows little effort and detail. Model incorporates few modifications needed for humans to live on assigned planet. Model not very creative.	Model shows no effort or detail. Model does not incorporate modifications needed for humans to live on assigned planet. Model shows no creativity.

Overall Group		Worked well together with group. Entire project is thoroughly completed and done well and shows a lot of effort. Entire presentation was interesting and engaging.	Group worked mostly well together. Project is not completely finished or could have been more thorough and detailed and show more effort. Presentation was mostly interesting and engaging.	Group did not always work together well. Parts of project are missing or incomplete and could use much more effort. Presentation was not interesting or engaging.	Group did not work together well. Many parts of the project are missing or incomplete. Minimal effort is shown. Presentation was not interesting or engaging.
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Total Points \_\_\_\_\_ X 3 = \_\_\_\_\_ / 57



## **Grade 7: Genetics**

Designer genes: One size fits all?

### **Unit Summary:**

Student biologists' research genetic engineering and issues related to risks and benefits of altering agricultural products. Students use their knowledge to create proposals for the town council of *Ixtapa, Mexico* and create slideshows, newsletters, or Web sites to share their opinions and help the council decide whether they want local farmers to plant genetically engineered corn

### **Standards Alignment**

This unit is aligned to Common Core State Standards and Next Generation Science Standards.

Molecular basis of heredity

MS.LS1 From Molecules to Organisms: Structures and Processes;

MS.LS3 Heredity: Inheritance and Variation of Traits

### **Curriculum-Framing Questions**

#### **Essential Question**

Just because we can, should we?

#### **Unit Questions**

Should genetic engineering be permitted in our society?

Do the benefits of genetically engineered foods outweigh the risks?

#### **Content Questions**

What is genetic engineering?

How are the traits of an organism passed from generation to generation?

### **Assessment Processes**

The unit begins with the introduction of the Essential Question, Just because we can, should we? It is posed to prompt discussion and engage students' prior knowledge of genetics. Journals are then introduced and used by the students throughout the unit to record individual thoughts, questions, and responses to discussions and questions. This journal is a valuable assessment tool, collected at the end of the unit to assess each student's individual learning process and higher-order thinking. The student assessment is introduced and discussed at the beginning of the project to set clear expectations. This scoring guide is used during project work by the students to guide their progress and by the teacher at the end of the unit to assess final products. One-on-one conferences with the students help both the teacher and students to monitor progress

and stay on track. The argumentation rubric is used by students as a self-check to ensure that they are creating strong arguments for their opinions in their proposals and communicating those to the audience. Have the council fill out the rubrics as a form of peer feedback after presentations are given. Peer feedback is given while students are creating and practicing their presentations using the peer feedback form. Students should use feedback to modify and improve their presentations.

### **Instructional procedures**

This unit will take place after students have learned the basics of genetics and heredity, emphasizing how traits are passed from one generation to the next.

#### **Scenario**

*"You and your fellow biologists have been asked to serve as expert advisors to the district council of Ixtapa, Mexico. Corn weevils have infested the corn of Ixtapa, severely reducing the major food source in this agrarian district. Malnutrition is a real concern. Additionally, employment and the related economy are also suffering. A promising strain of weevil-resistant corn, called Wvbgone Corn, is in development in the United States. Should this research be pursued? Should Wvbgone Corn be planted in Ixtapa?"*

#### **Collect Information and Create Proposals**

Review expectations and requirements for the project.-see project scoring guide

Remind students to consider the following questions while doing their research:

1. *What traits have been genetically engineered into corn and why?*
2. *What are some of the benefits and risks to genetic engineering? (health, environmental, ecological, and social)*
3. *Do the benefits of genetically engineered foods outweigh the risks?*
4. *Should genetic engineering be permitted in our society?*

#### **Prepare to Share**

Allow student scientists to choose groups and decide which presentation format will most effectively help convince their audience of their advice for dealing with the issue. They can create a slideshow, newsletter, or Web site. Students will use the "argumentation rubric" to guide their presentation

#### **Present Findings**

Student "expert" groups present their findings to the district council (the class)

**Prerequisite skills**

- Students will understand the structure of DNA and be familiar with DNA replication.
- They will be aware of how mutations happen in nature and have a working knowledge of the techniques involved in genetic engineering.
- Basic research skills
- Basic computer skills, including knowledge of slide show presentation

**Credits**

Nancy Floerke participated in the Intel® Teach Program, which resulted in this idea for a classroom project.

## **Grade 8: Chemistry**

### **Title: Lights, Camera, Reaction!**

#### **Unit Summary**

First-year chemistry students learn the basics of chemical reactions, and then dig deeper to produce unique multimedia demonstrations. Online simulations and microscaled investigations allow students to study many reactions safely in a short period of time. Small groups of students are assigned one of five basic chemical changes (synthesis, decomposition, single displacement, double displacement, or combustion) for further investigation. After careful consideration, each student selects one reaction and demonstration that best illustrates the particular reaction, and develops a slideshow presentation. As a final assessment, students are given a unique "recipe" for a set of reactants, and they are asked to identify the reaction type and the products that are likely to result.

#### **Standards Alignment**

- MS.PS1 Matter and Its Interactions

#### **Curriculum-Framing Questions**

- **Essential Question**  
What causes change?
- **Unit Questions**  
How do patterns allow us to predict chemical reactions and their products?  
How do chemical reactions affect everyday life?
- **Content Questions**  
What is a chemical reaction?  
How does chemical change occur?  
How can you tell if a change is chemical or physical?

#### **Assessment Processes**

See rubric attached.

#### **Instructional Procedures**

##### **Assess Prior Knowledge**

Introduce the project with the Essential Question, *What causes change?* Prepare a slideshow of various pictures that demonstrate physical change (such as fall colors,

volcanoes erupting, fireworks, landfills, and so forth). Have students share evidence that change has taken place in the pictures. Lead the discussion so that students discern chemical changes versus physical changes.

Use Online Labs simulation that allows students to carry out a number of different reactions and classify them as chemical or physical changes. As students complete the online investigations, ask them to record their thoughts and explanations for what they see taking place. Use the following questions to prompt further thinking:

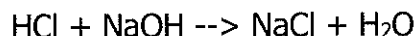
- What is required for a chemical reaction to take place?
- Why does chemical change occur?
- How can you tell if a change is chemical or physical?

Check for understanding by having the students complete an online quiz.

### **Foundation Knowledge**

Explain the fundamental features of chemical change, and describe how it differs from physical change. Use online videos, virtual simulations, and slideshows to deliver instruction on the five types of chemical reactions (synthesis, decomposition, single displacement, double displacement, and combustion) and the six signs that suggest chemical reactions have occurred (emission or absorption of heat, emission of light, formation of a solid, formation of a gas, color change, and odor).

Explain that in its most basic sense, a chemical reaction is an event in which atoms rearrange themselves and bind together in new ways. Sometimes, this involves a single substance, such as when three oxygen molecules rearrange their atoms to form two ozone molecules, or  $2\text{O}_3$ , or it can involve two or more substances, such as when an acid and a base combine to form salt and water as follows:



Explain that chemical reactions can either take in or give out energy when the atoms rearrange themselves. When oxygen is converted to ozone, it takes in the energy supplied by sunlight. When an acid reacts with a base resulting in salt and water, it gives out energy as heat. A reaction that takes in energy is *endothermic*, and a reaction that gives out energy is *exothermic*.

### **Explore**

Set up stations in the classroom in which students complete a microscale investigation on each type of chemical reaction. After students have completed each station, have students complete a summary for each investigation. Responses to the summary questions will be used to gauge their understanding of chemical reactions. Discuss the Content and Unit Questions, *How can you tell if a change is chemical or*

*physical? and How do patterns allow us to predict chemical reactions and their products?*

### **Lights, Camera...**

Introduce the scenario that a local cable channel would like to hire a group to produce an educational instructional video, podcast or slideshow to air during National Chemistry Week (October). Explain that each group is assigned one of the reaction types. Each group then produces a digital product (for example, a wiki, video, animation, podcast, or student slideshow) that is informative and keeps the attention of the audience.

Divide students into groups and assign one reaction type to each group (if the class is large, assign reaction types to more than one group). Using print and electronic sources, students study one reaction type and answer the following questions:

- *What are the features of the chemical reaction?*
- *What patterns allow you to predict the reaction and its products?*
- *What variety of substances can be combined to result in the reaction?*
- *What are some everyday examples of the reaction?*
- *How do chemical reactions affect everyday life?*

### **Look Deeper**

Have student groups research an everyday example of their type of chemical reaction and prepare a demonstration or experiment on the topic. Encourage students to explore topics that are relevant to their lives and impact society in some way (such as waste management, fireworks, and so forth). Students will use Online Labs and PhET Simulations as an alternative to performing actual experiments. After students deliberate about which example best illustrates a reaction type, have them submit a proposal that includes the following:

- Description of the microscale demonstration
- Rationale for the choice
- Preparation and material requirements
- Detailed procedures

Provide work time for groups to proceed with implementation of their lab demonstration and to create their digital products of learning. Students may choose to use a still or video camera to capture important parts of the process to embed in their presentations.

### **Teach Others**

Have students present their digital products. Presentations should last from 5 to 10 minutes with another 5 minutes reserved for fielding questions from the group. Assess students as they present their projects using the slideshow rubric or a similar project rubric.

**Prove It**

Ask students to write answers to the following questions, which were posed at the start of this unit of study:

- *What is a chemical reaction?*
- *How does chemical change occur?*
- *How can you tell if a change is chemical or physical?*

Administer the reaction quiz to test students' skills in recognizing reaction patterns and predicting the products of a chemical reaction.

**Prerequisite Skills**

- General understanding of the periodic table arrangement.
- Understanding of element characteristics in reference to forming chemical compounds.
- Knowledge of ionic and covalent bonding.
- Basic research skills.
- Basic computer skills, including knowledge of slideshow presentation and desktop publishing software.

**Credits**

Teresa Kelley participated in the Intel® Teach Program, which resulted in this idea for a classroom project. A team of teachers expanded the plan into the example you see here.

"Lights, Camera, Reaction!"

Project Rubric Names: \_\_\_\_\_

Period: \_\_\_\_\_ Date: \_\_\_\_\_ Reaction: \_\_\_\_\_

Category	4	3	2	1
<b>Foundation Knowledge of Reaction</b>	<p>Reaction type is defined accurately and thoroughly.</p> <p>Thorough and detailed explanation is given on how to recognize and categorize reaction type.</p> <p>All rules for all products of reaction are described.</p> <p>Detailed explanation of how to predict products is given.</p> <p>Three reactions are given with correct example equations.</p>	<p>Reaction type is defined accurately.</p> <p>An explanation is given on how to recognize and categorize reaction type.</p> <p>Most rules for most or all products of reaction are described.</p> <p>Explanation of how to predict products is given.</p> <p>Three reactions are given with example equations that contain minor errors.</p>	<p>Reaction type is defined, but the definition has some inaccuracies.</p> <p>A brief explanation is given on how to recognize or categorize reaction type.</p> <p>Some rules for some or most products of reaction are described.</p> <p>Explanation of how to predict products is incomplete.</p> <p>Two reactions are given with example equations, which may contain minor errors.</p>	<p>Reaction type is not defined. The explanation for how to recognize or categorize reaction type is inaccurate or missing.</p> <p>Rules for products of reaction are not described.</p> <p>Explanation of how to predict products is missing.</p> <p>One reaction is given with an example equation, and it may have errors.</p>
<b>Application of Research</b>	<p>Research and a demonstration of reaction type relates to a topic that impacts everyday life (such as waste management).</p> <p>A complete microscaled experiment has been conducted.</p>	<p>Research and a demonstration of reaction type somewhat relates to a topic that impacts everyday life (such as waste management).</p> <p>A mostly complete microscaled experiment has been conducted.</p>	<p>Research or a demonstration of reaction type relates to a topic that does not impact everyday life.</p> <p>A microscaled experiment has been conducted, but it may not have been finished.</p>	<p>Research or a demonstration of reaction type is missing or irrelevant.</p> <p>A microscaled experiment has not been completed. The scientific process has not been followed, or the documentation is missing.</p>



	<p>The scientific process has been followed and is well documented in the presentation.</p> <p>Reaction type is effectively illustrated by images or video.</p> <p>Three or more resources are cited and used in the presentation.</p>	<p>The scientific process has been followed, but the documentation is very general.</p> <p>Reaction type is illustrated by images or video.</p> <p>Two resources are cited and used in the presentation</p>	<p>The scientific process has partially been followed, or the documentation is vague.</p> <p>Reaction type is illustrated by images or video, but the reaction type is not very clear.</p> <p>One resource is cited and used in the presentation</p>	<p>Reaction type is not illustrated.</p> <p>No resources are cited or used in the presentation.</p>
<b>Presentation</b>	<p>All group members participated.</p> <p>Ideas are conveyed in a logical, coherent manner, and the media supports each phase of the presentation.</p> <p>Group shows an excellent command of the topic, and preparation and practice are evident.</p>	<p>Most group members participated.</p> <p>Ideas are conveyed in a logical manner, and the media supports most phases of the presentation.</p> <p>Group shows a good command of the topic, and preparation is evident.</p>	<p>Some group members participated.</p> <p>Ideas are conveyed in a somewhat logical manner, and the media supports some phases of the presentation.</p> <p>Group needs a better command of the topic, and some preparation is evident.</p>	<p>One group member dominated the presentation.</p> <p>Ideas are not conveyed in a logical manner, and the presentation is difficult to understand.</p> <p>Group shows a minimal understanding of the topic, and minimal or no preparation is evident.</p>