Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe educational environment for all students to attain the skills and knowledge specified in the New Jersey Core Curriculum Content Standards at all grade levels so as to ensure their full participation in our global society as responsible, self-directed, and civic-minded citizens.*

Course Title:	**Science**
Grade Level(s):	**5**

Duration:	*Full Year*		*Semester:*	X	*Marking Period:*	**1-2**
Course Description:	The Washington Township School District fifth grade curriculum uses an integrated approach to general science that focuses on units in physical, life, and earth science. By using this approach, teachers are able to meet the needs of all students while aligning with the New Jersey Model Curriculum and the Next Generation Science Standards. Hands-on activities are stressed and include student discovery experiments, problem solving, model building, cooperative learning, technology integration, classroom discussion, teacher demonstrations, and writing opportunities for research and self-expression. Interdisciplinary subject areas are incorporated whenever possible. Students are introduced to the use of scientific tools and methods used for investigations. The course is designed to be implemented using the 5E Model of Instruction: Engage, Explore, Explain, Extend/Elaborate, and Evaluate. The major topics of study for fifth grade are taken specifically from the Next Generation Science Standards: • Structure and Properties of Matter • Matter and Energy in Organisms and Ecosystems • Earth's Systems • Space Systems: Stars and the Solar System • Engineering Design					
Grading Procedures:	**Major - 60%** **Minor - 40%**					
Primary Resources:	**National Geographic Learning/Cengage Learning** **Exploring Science & Mystery Science**					

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

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Written: August 2017

Revised: July 2024 by Donna McGough and Danielle Narcisi

BOE Approval:

Unit Title: UNIT 1: Physical Science: Structure and Properties of Matter

Unit Duration: 22 instructional periods (includes 21 lessons, 3 quiz/review days, 1 unit review day and 1 test day)

Supplemental Reading Lessons in Ladders: Physical Science: *The Sinking of the Titanic, The World's Ocean*

Unit Description: In this Physical Science Unit, students will use investigation, observation and research to study matter. They will explore physical states and properties of matter as well as characteristics of each. They will study how matter can change phases through heating, cooling, and dissolving. They will understand that matter has always existed and will always exist in one form or another and that regardless of any physical or chemical change, the amount of matter is conserved. Students will think like scientists as they develop models, measure and graph quantities, and conduct their own investigations.

Desired Results

New Jersey Student Learning Standards:

5-PS1-1.	Develop a model to describe that matter is made of particles too small to be seen.
5-PS1-2.	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.
5-PS1-3.	Make observations and measurements to identify materials based on their properties.
5-PS1-4.	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Indicators:
PS1.A: Structure and Properties of Matter
PS1.B: Chemical Reactions

Understandings:
Students will understand that…

- Matter has mass and takes up space.
- Matter consists of particles too small to be seen, but even matter that cannot be seen still exists and can be detected by other means.
- Matter can exist in different states.
- Matter can be identified based on a variety of properties, such as hardness, color, reflectivity, magnetism, electrical conductivity, thermal conductivity, solubility, heating, and cooling
- The amount (weight) of matter is conserved when it changes form, even when it seems to vanish.
- Matter can undergo a chemical change, which is different than a physical change.
- When two or more substances are mixed, a new substance with different properties may be formed.
- Regardless of what reaction or change in matter occurs, the total weight does not change.

Essential Questions:

- What is matter?
- How does matter change physical states and how are these states different?
- How can I develop a model to prove that matter is made of particles too small to be seen?
- How can we use physical properties to identify matter?
- What is the Law of Conservation of matter?
- How can I provide evidence that matter is conserved, even after heating, cooling, and mixing?
- What is the difference between a physical change and a chemical change?
- What evidence shows that a chemical reaction has occurred?
- How can I prove that a new substance forms when some materials are mixed?
- How can I prove that the matter is conserved during a chemical reaction?

Assessment Evidence

Performance Tasks:
Investigate Lessons: Students will practice performance tasks in cooperative groups engaging in scientific inquiry.

- Investigate Matter- Infer that a solution contains particles too small to be seen
- Investigate Hardness- Determine the hardness of minerals by performing scratch tests
- Investigate Electrical Conductivity- Identify materials that conduct and do not conduct electricity
- Investigate Solubility- Determine the solubility in water of various materials
- Investigate Changing States of Water-1. Determine whether matter is conserved during a change of state. 2. Describe changes in the physical properties of matter that occur during changes in state
- Investigate Mixtures- Determine whether matter in conserved when one material is mixed with another material
- Investigate Chemical Reactions- Demonstrate that matter is conserved though changed during chemical reactions

Performance Expectations:
Think Like a Scientist: Students will develop a model, provide evidence, & identify materials cooperatively using science inquiry, analyzing data and drawing conclusions. All information will be recorded in Interactive Science Notebook and evaluated based on Teacher and Student Rubrics.

- Students will be able to develop a model to describe that matter is made of particles too small to be seen; construct and test a model; evaluate the validity of a model; use a model to successfully communicate a concept
- Students will be able to provide evidence that supports the laws of conservation of matter; plan and conduct an investigation; organize, analyze, and interpret data; express a scientific generalization
- Students will be able to distinguish materials based on an analysis of their physical and chemical properties

Other Evidence:

Students will demonstrate their understandings through:

- Science Notebook
- Science in a Snap
- Research Scientist
- Quizzes
- Unit Test

Benchmarks: Benchmark will be given at the end of Unit 2.

Learning Plan		
Lesson and Duration	**Activities**	**Materials/ Suggested Resources**
Let's Explore Online text p. 18-19 **1.1: Matter** Textbook p. 4-5 Online text p. 22-23 **1.2: States of Matter - Science in a Snap** Textbook p. 6-7 Online text p. 24-25 **1.3: Investigate: Matter** Textbook p. 8-9 Online text p. 26-27 ***NJSLS PS1.A*** *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* **Objective:** Students will be able to ● define matter as having mass and taking up space and describe matter as consisting of particles ● compare and contrast the properties of solids, liquids, and gasses ● infer that a solution contains particles too small to see **Duration:** 3 days	**Let's Explore and 1.1: Matter** **Engage**: ● Complete Let's Explore Activity ● Teacher-Led Demo: Students predict what will happen when a cup is put in water ● Think-Pair-Share: Ask questions for discussion **Explore:** ● Think about matter ● Set purpose and read text **Explain:** ● Describe matter as having mass and taking up space ● Describe matter as consisting of particles ● Teach the dimensions **Elaborate:** ● Design a demonstration **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **1.2: States of Matter** **Engage**: ● Teacher-Led Demo: Students explain what is happening to the balloon ● Think-Pair-Share: Ask questions for discussion **Explore:** ● Explore states of matter ● Set purpose and read text **Explain:** ● Explain differences among the particles of solids, liquids, and gasses ● Complete Science in a Snap activity ● Teach the dimensions **Elaborate:** ● Students extend thinking about states of matter **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Four-Square Diagram **1.3: Investigate: Matter** **Engage**: ● Use Photography: Students examine a photograph ● Graffiti Board: Students explain what is happening in the photograph **Explore:** ● Carry out the investigation **Explain:** ● Share and explain findings ● Teach the dimensions ● Read leveled science article, "Salt from the Ocean" **Elaborate:** ● Ask questions to help students investigate further **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	Interactive Science Notebook (ISN) Access to Internet Salt Plastic Cup – about 9 oz. Water Balloon String Safety Goggles Salt Plastic Cup – about 9 oz. Water Plastic Teaspoon Dropper Black Construction Paper Hand Lens Video: Crash Course Kids 3.1 What's Matter? https://www.youtube.com/watch?v=ELchwUIlWa8 Video: Crash Course Kids 3.2 (Part)icles of Your World https://www.youtube.com/watch?v=npv74D2MO6Q The Matter Song: https://www.youtube.com/watch?v=jQ5VbjWetUE Phenomenon: show short video: Ice to Vapor in 25 Seconds! https://www.youtube.com/watch?v=UbZLTrDjwa8 **Optional Mystery Science Activity**: See prep work, materials and handouts in this link as well. Why do some things explode: https://mysteryscience.com/chemistry/mystery-5/gases-particle-models/169?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity: https://mysteryscience.com/chemistry/mystery-5/gases-particle-models/169?vocab=true&t=student#slide-id-16098

1.4: Think Like a Scientist: Develop a Model Textbook p. 10-11 Online text p. 28-29 ***NJSLS PS1.1*** *Develop a model to describe that matter is made of particles too small to be seen.* **Objective:** Students will be able to ● develop a model to describe the matter that is made of particles too small to be seen; construct and test a model, evaluate the validity of a model, and use a model to successfully communicate a concept. **Duration:** 2 days	**Engage**: ● Use Photography: Students explain how particle behavior explains movement of a hot air balloon ● Think-Pair-Share: Ask questions for students to discuss ● Teach the dimensions ● Construct an explanatory model **Explore:** ● Conduct an investigation **Explain:** ● Analyze results and revise model ● Share model **Elaborate:** ● Apply results ● Elaborate on learning ● Ask questions to help students investigate further ● Teach the dimensions **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Variety of 2-3 dimensional materials such as: paper, poster board, foam, foil, clay, snap blocks, chenille stems, craft sticks, and any others that can be used for modeling **Optional National Geographic:** Stories in Science: Scientist and Role Model Online text p. 30-31
QUIZ 1		
1.5: Properties of Matter Textbook p. 12-13 Online text p. 32-33 **1.6: Hardness - Science in a Snap** Textbook p. 14-15 Online text p. 34-35 **1.7: Investigate: Hardness** Textbook p. 16-17 Online text p. 36-37 ***NJSLS PS1.A*** *Measurements of a variety of properties can be used to identify materials* **Objectives:** Students will be able to ● identify seven physical properties of matter ● describe hardness and order the degrees of hardness of various materials. ● determine the hardness order of minerals by performing scratch tests **Duration**: 2 days	**1.5: Properties of Matter** **Engage**: ● Teacher-Led Demo: Students list characteristics of items ● Students identify objects they have seen and tell how they identified the object **Explore:** ● Explore properties of matter ● Set purpose and read text **Explain:** ● Define physical properties ● Teach the dimensions **Elaborate:** ● Extend thinking about properties of matter by asking students how they would identify objects **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **1.6: Hardness** **Engage**: ● Use Photography: Students examine a photograph ● Students list a variety of objects they have seen in the past few days **Explore:** ● Explore hardness ● Set purpose and read text **Explain:** ● Differentiate between objects of different hardness ● Complete Science in a Snap activity ● Teach the dimensions **Elaborate:** ● Find out more about hardness **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It	ISN Plastic spoon Aluminum washer Copper Penny Steel paper clip Rubber Band Orange crayon Iron nail Chart/data table Access to internet 4 different minerals labeled: calcite, quartz, talc & feldspar Hand lens Safety goggles

-	Up questions in their science notebooks **1.7: Investigate: Hardness** **Engage**: ● Use Photography: Students examine a photograph ● Students describe what happens when one object scratches another **Explore:** ● Carry out the investigation **Explain:** ● Share and explain findings ● Teach the dimensions ● Review the Moh's Hardness Scale **Elaborate:** ● Facilitate a discussion about the hardness of items in the home **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	
1.8: Magnetism - Science in a Snap Textbook p. 18-19 Online text p. 38-39 ***NJSLS PS1.A*** *Measurements of a variety of properties can be used to identify materials* **Objective:** ● Students will be able to describe magnetism, identify substances that are attracted to a magnet and explain how the property of magnetism can be tested. **Duration:** 1 day	**Engage**: ● Use Photography: Students examine a photograph ● Students explain how they have used magnets **Explore:** ● Explore magnetism ● Set purpose and read text **Explain:** ● Differentiate between materials that are attracted to a magnet and those that are not ● Complete Science in a Snap activity ● Teach the dimensions **Elaborate:** ● Ask questions to help students extend thinking about magnetism ● Compare natural magnets versus electromagnets **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Eraser Iron Steel Nail Paper Clip Iron or Steel washer Penny Glass marble Bar magnet Access to internet **Optional Mystery Science Activity**: See prep work, materials and handouts in this link as well. What would happen if you drank a glass of acid? https://mysteryscience.com/chemistry/mystery-3/properties-of-matter-acids/168?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity: https://mysteryscience.com/chemistry/mystery-3/properties-of-matter-acids/168?vocab=true&t=student#slide-id-16078

1.9: Electrical Conductivity Textbook p. 20- 21 Online text p .40-41 **1.10: Investigate: Electrical Conductivity** Textbook p. 22-23 Online text p. 42-43 ***NJSLS PS1.A:*** *Measurements of a variety of properties can be used to identify materials.* **Objective:** Students will be able to ● classify matter based on its ability to conduct or insulate electrical energy. **Duration**: 1 day	**1.9: Electrical Conductivity** **Engage**: ● Use Photography: Students examine a photograph ● Students list a variety of objects that have electrical cords **Explore:** ● Define electricity ● Explore electrical conductivity ● Set purpose and read text **Explain:** ● Classify matter based on conductivity ● Teach the dimensions **Elaborate:** ● Electrical conductors and insulators used together **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **1.10: Investigate: Electrical Conductivity** **Engage**: ● Use Photography: Students examine a photograph ● Students recall what they have learned about electrical conductivity **Explore:** ● Carry out the investigation **Explain:** ● Share and explain findings ● Teach the dimensions **Elaborate:** ● Students walk around school to try to find the place where the electrical wires enter the building from the utility poles **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Access to internet 1 light bulb in holder 1 D cell in holder 2 15 cm. Wires Materials to test such as: ● Nail ● Aluminum foil ● Index card ● Eraser ● Craft stick ● Paper clip ● Washer ● Cork ● Plastic button ● Safety Goggles
1.11: Thermal Conductivity - Science in a Snap Textbook p. 24-25 Online text p. 44-45 ***NJSLS PS1.A****:* *Measurements of a variety of properties can be used to identify materials* **Objective:** Students will be able to ● classify matter based on its ability to conduct or insulate thermal energy. **Duration**: 1 day	**Engage**: ● Use Photography: Students examine a photograph ● Students explain how it felt when they held a ceramic cup full of hot cocoa **Explore:** ● Explore thermal conductivity ● Set purpose and read text **Explain:** ● Define thermal energy ● Explain thermal conductors and thermal insulators ● Complete Science in a Snap activity ● Teach the dimensions **Elaborate:** ● Ask questions to help students find out more about thermal conductors and insulators **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Access to internet Metal spoon Plastic spoon Foam or Ceramic cup

1.12: Investigate: Solubility Textbook p. 26-27 Online text p. 46-47 ***NJSLS PS1.A:*** *Measurements of a variety of properties can be used to identify materials* **Objective:** Students will be able to ● determine the solubility of various materials. **Duration**: 1 day	**Engage**: ● Teacher-Led Discussion: Students predict what happened to sugar that was stirred into a cup of water ● Partner Share: Ask questions for students to discuss **Explore:** ● Introduction to solubility and solutions ● Carry out the investigation **Explain:** ● Share and explain findings ● Teach the dimensions **Elaborate:** ● Read leveled science article, "Our Salty Ocean" ● Ask questions to help students further investigate solubility **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Access to Internet 4 identical plastic cups Sand Plastic spoon Sea salt Lemon Juice Vegetable Oil Clock or Stop Watch Safety goggles Warm Tap Water (teacher) Graduated Cylinder (teacher) **Optional Mystery Science Activity** See prep work, materials and handouts in this link as well. Could you transform something worthless into gold? https://mysteryscience.com/chemistry/mystery-2/dissolving-particulate-nature-of-matter/167?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity: https://mysteryscience.com/chemistry/mystery-2/dissolving-particulate-nature-of-matter/167?vocab=true&t=student#slide-id-16067
QUIZ 2		

1.13: STEM Engineering Project: Design a Lunchbox Online text p. 52-55 ***NJSLS 3-5-ETS1-2:*** *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.* **Objective:** Students will be able to ● define the engineering problem they need to solve, including the criteria and constraints ● Plan and carry out fair tests to compare the insulating properties of three materials ● Design and build a prototype of a lunchbox that uses insulation to keep	**Engage**: ● Use Photography: Students examine a photograph ● Groups of students develop 5-6 questions about what they see in the photograph ● Define the problem **Explore:** ● Carry out the investigation ● Find a solution ● Test your solution ● Refine or change your solution **Explain:** ● Share and explain findings **Elaborate:** ● Investigate further how insulation is used to make homes comfortable and and to save energy **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Access to Internet Ice water Hot water Shoebox 3 16 oz. bottles of water 3 thermometers Scissors Tape Ruler Stopwatch Insulating materials such as ● aluminum foil ● cotton batting ● bubble wrap ● newspaper ● fleece ● felt Graph paper Colored pencils

food warm or cold ● Test the prototype and analyze their results to determine if it meets the criteria of the problem ● Use the results of their tests and ideas from other groups' prototypes to improve their design **Duration**: 2 days		
<u>1.14: Heating</u> Textbook p. 28-29 Online text p. 48-49 **<u>1.15: Cooling</u>** Textbook p. 30-31 Online text p. 50-51 ***NJSLS PS1.A****: The amount of matter is conserved when it changes form, even in transitions in which it seems to vanish.* **Objective:** Students will be able to ● define and identify the boiling and melting point of water; describe how boiling affects the state of water. ● define condensation and describe how cooling of water can change its state. **Duration**: 1 day	**<u>1.14: Heating</u>** **Engage**: ● Use Video: Students watch the video "Pouring Liquid Nitrogen" ● Students recall the effects of heat on ice cubes and liquid water **Explore:** ● Explore heating ● Set purpose and read text **Explain:** ● Define key terms ● Explain the effects of heating ● Teach the dimensions **Elaborate:** ● Examine a table to determine materials by their properties **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **<u>1.15: Cooling</u>** **Engage**: ● Use Video: Students watch the video "Freezing with Liquid Nitrogen" ● Partner Talk: Students recall a time when water seemed to appear out of nowhere **Explore:** ● Explore cooling ● Set purpose and read text **Explain:** ● Explain condensation ● Compare and contrast condensation and freezing **Elaborate:** ● Discuss an experience you have had that supports the idea that exhaled air contains water vapor **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap	ISN Access to Internet **Video:** Vacation or Conservation (Of Mass): Crash Course Kids #23.1 https://www.youtube.com/watch?v=3lHHOiTdmK4

	It Up questions in their science notebooks	

<u>1.16: Investigate: Changing States of Water</u> Textbook p. 32-33 Online text p. 56-57 ***NJSLS PS1.A****: The amount of matter is conserved when it changes form, even in transitions in which it seems to vanish* **Objective:** Students will be able to ● determine whether matter is conserved during a change in state and describe the changes in physical properties of matter that occur during changes in state. Duration: 1 day	**Engage**: ● Use Photography: Students examine a photograph ● Students recall changes to a closed container of ice cream in a freezer and after it stood at room temperature **Explore:** ● Carry out the investigation **Explain:** ● Share and explain findings ● Teach the dimensions **Elaborate:** ● Students think about how to design an investigation to prove water has not disappeared, but changed states twice ● Virtual Lab **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Internet access Per group: 2 resealable plastic sandwich bags Masking tape Graduated cylinder Pitcher of water Balance scale Gram masses
Omit Lesson 17 - discuss definition of mixture vs. solution in Lesson 12		

1.18: Think Like a Scientist: Provide Evidence Textbook p. 36-37 Online text p. 60-61 **NJSLS PS1.2***: Measure and graph the 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.* **Objective:** Students will be able to ● find evidence that supports the Law of Conservation of Matter, plan and conduct an investigation, organize, analyze, and interpret data, and express a scientific generalization. Duration: 2 days	**Engage**: ● Use Diagrams: Students examine a collage ● Students discuss the Law of Conservation of Matter ● Ask a Question ● Plan an Investigation **Explore:** ● Conduct an investigation **Explain:** ● Analyze and interpret data ● Teach the dimensions ● Share your results **Elaborate:** ● Investigate further physical changes that prove conservation of matter ● Elaborate on what you have learned 3-2-1 activity ● Teach the dimensions **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	Choose from various liquids and solids such as: ● Water ● Lemon juice ● Vegetable oil ● Ice ● Clay sand ● Sugar cubes ● Baking soda ● Salt ● Paper ● ISN **Optional Mystery Science Activity**: See prep work, materials and handouts in this link as well. Are magic potions real? https://mysteryscience.com/chemistry/mystery-1/conservation-of-matter/166?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity https://mysteryscience.com/chemistry/mystery-1/conservation-of-matter/166?vocab=true&t=student#slide-id-16056
QUIZ 3		
1.19: Chemical Changes Textbook p. 38-39 Online text 62-63 **1.20: Signs of a Chemical Change** Textbook p. 40-41 Online text p. 64-65 **1.21 Investigate: Chemical Reactions** Textbook p. 42-43 Online text p. 66-67 ***NJSLS PS1.B:*** *When two or more different substances are mixed, a new substance with different properties may be formed. No matter what reaction or change in properties occurs, the total weight of the substances does not change.* ***NJSLS PS1.4****: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.* **Objective:** Students will be able to	**1.19: Chemical Changes** **Engage**: ● Use Photography: Students examine a photograph ● Students recall a time when they observed one material changing into one or more other materials **Explore:** ● Explore chemical changes ● Set purpose and read text **Explain:** ● Differentiate between a chemical change and a chemical reaction ● Contrast a chemical change and a physical change ● Teach the dimensions **Elaborate:** ● Research chemical changes **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **1.20: Signs of a Chemical Change** **Engage**: ● Use Video: Students view the video “Fireworks” ● Students discuss evidence of chemical change in a glow stick **Explore:** ● Explore signs of a chemical change ● Set purpose and read text **Explain:** ● Find out more about signs of a chemical change ● Watch the video “Structure and Properties of Matter” ● Teach the dimensions **Elaborate:**	ISN Access to Internet Safety goggles Per group: 100 mL graduated cylinder Large resealable plastic bag Balance scale Water Effervescent tablet Gram masses **Optional Mystery Science Activity:** See prep work, materials and handouts in this link as well. What do fireworks. rubber and silly putty have in common**?** https://mysteryscience.com/chemistry/mystery-4/chemical-reactions/110?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity https://mysteryscience.com/chemistry/mystery-4/chemical-reactions/110?vocab=true&t=student#slide-id-16089

● describe chemical changes and signs of a chemical change, compare chemical changes to physical changes, and demonstrate that matter is conserved during a chemical reaction. Duration: 2 days	● Research chemical changes that produce heat **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **<u>1.21: Investigate: Chemical Reactions</u>** **Engage**: ● Teacher-Led Demo: Students identify what kind of change is taking place ● Students discuss if mass changes during a chemical changes **Explore:** ● Carry out the investigation **Explain:** ● Share and explain findings ● Teach the dimensions **Elaborate:** ● Partner Talk: Design an investigation **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	

<u>1.22: Think Like a Scientist: Identify Materials</u> Textbook p. 44-45 Online text p. 68-69 ***NJSLS PS1.3:*** *Make observations and measurements to identify materials based on their properties.* **Objective:** Students will be able to ● distinguish materials based on an analysis of their physical and chemical properties. Duration: 1 day	**Engage**: ● Use Charts: Students examine a chart of properties of materials and their reactions with other materials ● Students discuss identifying materials that are not labeled ● Ask a Question **Explore:** ● Plan and conduct an investigation **Explain:** ● Analyze your results ● Share your results ● Teach the dimensions **Elaborate:** ● Students discuss how to identify metals that are not labeled ● Teach the dimensions **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Access to internet Each group: Corn Starch Baking soda Baking powder Water Vinegar Iodine- potassium iodide solution (10 mL) Dropper 13 clear 8 oz plastic cups 4 plastic spoons 10 cm x 10 cm squares of foil Safety goggles
Optional: **<u>1.23: Science Career: Research Scientist</u>** Textbook p. 46-47 Online text p. 70-71 ***NJSLS*** *Science investigations use a variety of tools and techniques.* **Objective:** Students will be able to ● identify the goal of research scientist Albert Yu-Min Lin and the tools he employs to reach that goal	**Engage**: ● Use Photography: Students examine a photograph ● Students discuss what a research scientist is and what kinds of problems they solve **Explore:** ● Explore research scientist Albert Yu-Mi Lin's work ● Set a purpose and read **Explain:** ● Explain what Albert Yu-Mi Lin does ● Teach the nature of science **Elaborate:** ● Students find out more about the career of research scientist ● Research other careers involving scientific research **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Access to internet

Duration: 1 day -		
Review		
Test		

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
NJSLS 5- PS1-1: Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]	
4.0	**Students will be able to:** ● Perform an internet search for images related to atoms, chemical solutions, or solar system models to discover how models are used to depict very large or small particles of matter. Based on the research, evaluate the models on their ability to demonstrate that matter is made of particles to small to be seen. Indicate which model is superior and why.
3.0	**Students will be able to:** ● Develop a model to provide evidence that matter is made of particles too small to be seen. ● Construct, test, and evaluate the validity of the model. Make revisions if necessary.
2.0	**Students will be able to:** ● Explain how a model, such as an inflated balloon or saltwater solution, shows that matter is made of particles too small to be seen. ● Use a model to successfully communicate a concept. ● Compare and contrast the arrangement and activity of particles in solids, liquids, and gases. ● Describe matter as consisting of particles. ● Define matter and mass.
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

NJSLS 5-PS1-2: 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. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]	
4.0	**Students will be able to:** ● Analyze other groups' investigation designs to determine which best provides evidence of matter conservation after a physical change. Justify and debate reasons for determination.
3.0	**Students will be able to:** ● Choosing from a variety of solid and liquid materials, plan and conduct an investigation 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. ● Organize, analyze, and interpret data from the investigation. ● Write a conclusion that provides evidence that matter was conserved after heating, mixing, or cooling.
2.0	**Students will be able to:** ● Describe how matter changes states. ● Define physical change. ● Understand the law of conservation of matter. ● Measure mass. ● Use evidence to support a claim.
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

NJSLS 5-PS1-3: Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]	
4.0	**Students will be able to:** ● Using their own research, design an investigation to test unknown metals based upon properties. Include relevant physical and chemical properties for testing each metal.
3.0	**Students will be able to:** ● Through investigation, observe and measure physical and chemical properties of unlabeled powdered materials (color, reaction to vinegar, solubility, and reaction to iodine). ● Analyze results of the investigation to identify each material. Use evidence to write a conclusion.
2.0	**Students will be able to:** ● Make and record observations during an investigation. ● Use measurement tools such as scales, microscopes, and timers. ● Use data from an investigation to answer a question. ● Describe physical and chemical changes. ● Define properties of hardness, reflectivity, magnetism, electrical conductivity, thermal conductivity, and solubility.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	
4.0	**Students will be able to:** ● Using tools such as narrow-mouth bottle, balloon, and a scale, design an investigation to test whether mixing vinegar and baking soda follows the principle of the conservation of matter.
3.0	**Students will be able to:** ● Through investigation, observe and collect data to determine if the mixture of water and an effervescent tablet results in a chemical reaction. Use evidence from the investigation to prove a new substance has formed and matter was conserved.
2.0	**Students will be able to:** ● Define chemical change and chemical reaction. ● Identify the signs of a chemical reaction. ● Understand that total mass of matter is conserved after a chemical change.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	● Allow students to work independently through Investigations, "Think Like a Scientist", and "Think Like an Engineer." ● Use the "Elaborate" sections of the lesson to extend student thinking
Struggling Learners	● Refer to "Learning Assessment Masters" for pre-made charts for interactive science notebook to use with Investigations, Science in a Snap, Think Like a Scientist, and Think like an Engineer. ● Pair with higher ability learners when appropriate ● Allow for small groups and mini lessons with teacher ● Vary roles in heterogenous groups to allow for different learning styles
English Language Learners	● Vocabulary: mass, matter, states of matter, gas, solid, liquid, property, hardness, magnetism, electrical conductivity, electrical conductor, electrical insulator, thermal energy, thermal conductor, thermal insulator, melting point, boiling point, physical change, conservation of matter, condensation, condense, mixture, chemical change, and chemical reaction ● Beginner: Ask basic questions for students to provide "yes" or "no" answers ● Intermediate: Provide sentence frames to allow ELL students to fill in the correct answers. IE: A chemical change____ occurring if heat is given off. (is) A chemical change____ occurring if light is produced. (is) ● Advanced: Help students complete sentence stems that have multiple items to complete
Special Needs Learners	● Refer to IEP's for modifications ● Refer to "Learning Assessment Masters" for pre-made charts for interactive science notebook. ● Modify Investigations, Science in a Snap, Think Like a Scientist, and Think Like an Engineer by chunking and shortening expected responses and tasks. ● Provide small group instructions

Interdisciplinary Connections

Indicators:
RL.CR.2.1 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1)

W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2),(5-PS1-3),(5-PS1-4)

W.SE.5.6. Gather relevant information from multiple valid and reliable print and digital sources; summarize or paraphrase information in notes and finished work, making note of any similarities and differences among ideas presented; and provide a list of sources.

W.WR.5.5. Establish a central idea about a topic, investigation, issue or event and use and quote several sources to support the proposed central idea.

Mathematics
MP.2 MP.4 MP.5 5.NBT.A.1
5.NF.B.7 5, 5.M.B.2,
5.M.A.15. 5.M.B.3
Reason abstractly and quantitatively. (5-PS1-1),(5-PS1-2),(5-PS1-3)
Model with mathematics. (5-PS1-1),(5-PS1-2),(5-PS1-3)
Use appropriate tools strategically. (5-PS1-2),(5-PS1-3)
Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)
Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2)
Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)
Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)

Integration of 21st Century Skills

Indicators:

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Understand and use technology systems.

- 8.1.5.A.1 Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems. Select and use applications effectively and productively.
- 8.1.5.A.2 Format a document using a word processing application to enhance text and include graphics, symbols and/ or pictures.
- 8.1.5.A.3 Use a graphic organizer to organize information about problem or issue. 8.1.5.A.4 Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data. 8.1.5.A.5 Create and use a database to answer basic questions.
- 8.1.5.A.6 Export data from a database into a spreadsheet; analyze and produce a report that explains the analysis of the data.

Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media. Communicate information and ideas to multiple audiences using a variety of media and formats. Develop cultural understanding and global awareness by engaging with learners of other cultures. Contribute to project teams to produce original works or solve problems.

- 8.1.2.C.1 Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media formats such as online collaborative tools, and social media.
- 8.1.5.C.1 Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings and present possible solutions, using digital tools and online resources for all steps. Plan strategies to guide inquiry. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
- 8.1.5.E.1 Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.

Identify and define authentic problems and significant questions for investigation. Plan and manage activities to develop a solution or complete a project. Collect and analyze data to identify solutions and/or make informed decisions. Use multiple processes and diverse perspectives to explore alternative solutions

- 8.1.5.F.1 Apply digital tools to collect, organize, and analyze data that support a scientific finding.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

The characteristics and scope of technology.

- 8.2.5.A.1 Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.
- 8.2.5.A.2 Investigate and present factors that influence the development and function of a product and a system.

The core concepts of technology.

- 8.2.5.A.3 Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.

The relationships among technologies and the connections between technology and other fields

- 8.2.5.A.4 Compare and contrast how technologies have changed over time due to human needs and economic, political and/or cultural influences.
- 8.2.5.A.5 Identify how improvement in the understanding of materials science impacts

The cultural, social, economic and political effects of technology.

- 8.2.5.B.1 Examine ethical considerations in the development and production of a product through its life cycle.

The effects of technology on the environment.

- 8.2.5.B.2 Examine systems used for recycling and recommend simplification of the systems and share with product developers.
- 8.2.5.B.3 Investigate ways that various technologies are being developed and used to reduce improper use of resources.

The role of society in the development and use of technology.

- 8.2.5.B.4 Research technologies that have changed due to society's changing needs and wants.
- 8.2.5.B.5 Explain the purpose of intellectual property law.

The attributes of design.

- 8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.
- 8.2.5.C.2 Explain how specifications and limitations can be used to direct a product's development.
- 8.2.5.C.3 Research how design modifications have led to new products.

The application of engineering design.

- 8.2.5.C.4 Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.
- 8.2.5.C.5 Explain the functions of a system and subsystems.

The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.

- 8.2.5.C.6 Examine a malfunctioning tool and identify the process to troubleshoot and present options to repair the tool.
- 8.2.5.C.7 Work with peers to redesign an existing product for a different purpose.

Apply the design process.

- 8.2.5.D.1 Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.
- 8.2.5.D.2 Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions.

Use and maintain technological products and systems.

- 8.2.5.D.3 Follow step by step directions to assemble a product or solve a problem.
- 8.2.5.D.4 Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.
- 8.2.5.D.5 Describe how resources such as material, energy, information, time, tools, people and capital are used in products or systems.

Assess the impact of products and systems.

- 8.2.5.D.6 Explain the positive and negative effect of products and systems on humans, other species and the environment, and when the product or system should be used.
- 8.2.5.D.7 Explain the impact that resources such as energy and materials used in a process to produce products or system have on the environment

Unit Title: Unit 2: LIFE SCIENCE: Matter and Energy in Organisms and Ecosystems

Unit Duration: 22 instructional periods (includes 20 lessons, 3 quiz/review days, 1 unit review day, 1 test day, 1 benchmark day)

Supplemental Reading Lessons in Ladders: Life Science: *African Savanna, The Galapagos Islands*

Unit Description: In this Life Science Unit, students will use investigation, observation, and research to understand that energy in animals' food was once energy from the sun that was captured by plants in the chemical process of photosynthesis. They will understand that plants get what they need for growth chiefly from air and water and that food provides animals with the materials they need to maintain body warmth and for motion. Finally, students learn that matter cycles among plants, animals, decomposers, and the environment. They will think like scientists when they use evidence to support an argument and develop models to represent events and design solutions.

New Jersey Student Learning Standards:

5-PS3-1. 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. [Clarification Statement: Examples of models could include diagrams, and flow charts.]

5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Indicators:

PS3.D: Energy in Chemical Processes and Everyday Life
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)

LS1.C: Organization for Matter and Energy Flow in Organisms
Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1)

LS2.A: Interdependent Relationships in Ecosystems
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)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems
Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gasses, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

Understandings: *Students will understand that…* ● Plants need energy to grow ● All energy comes from the sun ● Plants need air and water for growth ● Hydroponics can help increase food supply ● Animals need food ● Energy flows through a food chain ● Decomposers break down living organisms ● Matter cycles through an ecosystem ● Organisms need certain conditions to thrive ● Many organisms co-exist to make up an ecosystem ● Organisms interact with other organisms and inorganic elements ● Matter moves among plants, animals, decomposers, and the environment ● Newly introduced species can disrupt an ecosystem ● Conservationists study the natural world	**Essential Questions:** ● What are the three things plants need to live and grow? ● How do plants use energy from the sun? ● What problems can be solved with hydroponics? ● What are some conditions that make it difficult to grow food? ● Where does the food animals need come from? ● What is a food chain? ● How does energy transfer? ● What is the role of decomposers in a food chain? ● How is matter cycled through an ecosystem? ● What are the conditions organisms need within an environment? ● How are those needs met? ● What are the different levels of organisms in an ecosystem? ● How does matter move among plants, animals, decomposers, and the environment? ● How can new species disrupt an ecosystem? ● How can scientists use another species to control a population of invasive organisms? ● What does a conservationist do and why is it important?

Assessment Evidence

Performance Tasks: Investigate Lessons- Students will practice performance tasks in cooperative groups engaging in scientific inquiry. ● Investigate Hydroponics- Determine if plants can grow without soil ● Investigate Interactions in a model pond- Observe interactions among organisms in an ecosystem and describe the flow of energy **Performance Expectations:** Think like a Scientist- Students will develop a model, provide evidence, & identify materials cooperatively using science inquiry, providing evidence, analyzing data and drawing conclusions. All information will be recorded in Interactive Science Notebook and evaluated based on Teacher and Student Rubrics**.** ● Support an argument- Use evidence to support that plants get the materials they need for growth from mainly water and air ● Compare and Contrast- Use food chains to compare the pathway of energy from the sun through organisms ● Use Models- Create a model to show that energy in animals' food was once from the sun. ● Develop a model- Create the model to describe movement of matter among organisms ● Animals Invade – show how a species can invade an ecosystem and how scientists use other species to control it	**Other Evidence:** *Students will demonstrate their understandings through:* ● Science Notebook ● Science in a Snap ● Research Scientist ● Quizzes ● Unit Test
Benchmarks: Benchmark will be given at the end of Unit 2.	

Learning Plan		
Lesson and Duration	**Activities**	**Materials/ Suggested Resources**
<u>Let's Explore</u> Online text p. 74-75 **<u>2.1: What Plants Need</u>** Textbook p. 50-51 Online text p. 78-79 **<u>2.2: How Plants Get Energy</u>** Textbook p. 52-53 Online text p. 80-81 **<u>2.3: Materials for Plant Growth</u>** Textbook p. 54-55 Online text p. 82-83 ***NJSLS PS3.D*** *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)* **Objectives:** Students will be able to ● list three main things plants need to live and grow ● identify the source of energy that plants use to make the food they need to survive ● explain that the energy that plants use to live and grow was once energy from the sun and ● describe the process of photosynthesis ● explain that plants get the materials they need for growth chiefly from air and water Duration: 2 days □	**<u>Let's Explore and 2.1: What Plants Need</u>** **Engage**: ● Complete Let's Explore Activity ● Use Photography: Students examine a photograph ● Think-Pair-Share: Ask questions for discussion **Explore:** ● Think about what plants need ● Set purpose and read text **Explain:** ● Identify what plants need to live ● Compare plants and animals ● Explain how orchids survive ● Teach the dimensions **Elaborate:** ● Find out more about epiphytes **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **<u>2.2: How Plants Get Energy</u>** **Engage**: ● Use Photography: Students examine a photograph ● Partner Talk: Ask questions for discussion **Explore:** ● Think about how plants get energy ● Set purpose and read text **Explain:** ● Define photosynthesis and chlorophyll ● Describe the process of photosynthesis ● Teach the dimensions **Elaborate:** ● Find out more about photosynthesis ● Animation: Photosynthesis **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **<u>2.3: Materials for Plant Growth</u>** **Engage**: ● Use Video: Watch the video "Plant Cells" ● Students discuss the largest plants they have ever seen **Explore:** ● Discuss where bamboo plants get the materials they need ● Set purpose and read text **Explain:** ● Explain how plants get carbon dioxide and water ● Describe the role of mineral nutrients ● Teach the dimensions **Elaborate:** ● Plants and amount of carbon dioxide in the air **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Access to the internet **Optional Mystery Science Activity:** See prep work, materials and handouts in this link as well. What Do Plants Eat? https://mysteryscience.com/ecosystems/mystery-2/matter-plant-growth/94?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity: https://mysteryscience.com/ecosystems/mystery-2/matter-plant-growth/94?vocab=true&t=student#slide-id-15962

2.4 Think Like an Engineer Case Study: Growing Crops Textbook p. 56-59 Online text p. 84-87 ***NJSLS LS1.C:*** *Plants acquire their material for growth chiefly from air and water.* **Objective:** Students will be able to ● identify some of the conditions that make it difficult to grow enough food for all the people on the Earth and describe hydroponics and explain how it can help increase the supply of food for humans Duration: 1 day	**Engage**: ● Use Photography: Students examine a photograph ● Students discuss how living things get their energy **Explore:** ● Think about crops ● Set purpose and read text **Explain:** ● Identify the problem ● Identify the solution ● Teach the dimensions **Elaborate:** ● Find out more about hydroponics in space **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Access to internet

QUIZ 1		
2.5: Investigate: Hydroponics Textbook p. 60-61 Online text p. 88-89 ***NJSLS LS1.1:*** *Support an argument that plants get the materials they need for growth chiefly from air and water.* **Objective:** Students will be able to ● conduct an investigation to determine if plants can grow without soil. Duration: 1 day	**Engage**: ● Use Video: Watch the video attached to the article "Meals Ready to Eat" ● Students discuss what plants need to survive **Explore:** ● Carry out the investigation **Explain:** ● Share and explain findings **Elaborate:** ● Discuss the origin of the word hydroponics **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN For groups: 8 oz clear plastic container with a lid that has a hole in the center Young plant Pitcher of water 3 cotton balls 5 drops of liquid houseplant fertilizer

2.6: Think Like a Scientist: Support an Argument Textbook p. 62-63 Online text p. 90-91 **NJSLS LS1.1:** *Support an argument that plants get the materials they need for growth chiefly from air and water.* **Objective:** Students will be able to ● use evidence to support the argument that plants get the materials they need for growth chiefly from air and water. Duration: 1 day	**Engage**: ● Use Video: Students examine a time-lapse video of a flower growing from seed to bloom ● Students discuss what they have learned about plants ● Teach the dimensions **Explore:** ● Explore inferences ● Create a list **Explain:** ● Review list for accuracy ● Compare ● Construct an argument ● Generalize **Elaborate:** ● Investigate the role of chlorophyll in the food-making process ● Teach the dimensions **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebook ● Rubrics	ISN Paper
2.7: Why Animals Need Food Textbook p. 64-65 Online Text p. 92-93 **NJSLS LS1.C:** *Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.* **Objective:** Students will be able to ● explain that food provides animals with the materials they need for growth and body repair and the energy they need for motion and to maintain body warmth. Duration: 1 day	**Engage**: ● Use Video: Watch the video “Bear Catching Fish” ● Students share experiences feeding their pets **Explore:** ● Explore why animals need food ● Set purpose and read text **Explain:** ● Describe how an elephant gets and uses the energy in food ● Describe how animals get and use the energy in food ● Examine photos to compare and contrast how animals eat **Elaborate:** ● Revisit the video “Bear Catching Fish” **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Access to internet
2.8: Desert Food Chains Textbook p. 66-67 Online text p. 94-95 **2.9: Think Like a Scientist: Compare and Contrast** Textbook p. 68-69 Online text p. 96-97 ***NJSLS LS1.C:*** *Food provided animals with the material they need for body repair and growth and the energy they need to maintain body warmth and for motion.* ***NJSLS PS3.D****The energy*	**2.8: Desert Food Chains** **Engage**: ● Use Photography: Students examine a photograph ● Students draw or give examples of a chain in a necklace or bracelet **Explore:** ● Think about food chains ● Set purpose and read text **Explain:** ● Describe food chains ● Identify producers and consumers in a food chain ● Describe the flow of energy through a desert food chain ● Teach the dimensions **Elaborate:** ● Find out more about consumers	ISN Access to Internet crayons/colored pencils **Optional Mystery Science Activity**: See prep work, materials and handouts in this link as well. Why would a hawk move to New York City? https://mysteryscience.com/ecosystems/mystery-1/food-chains-producers-consumers/119?code=NzQ0Nzk3NjI&t=student&chapter=all

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) **Objective:** Student will be able to ● use a food chain to describe the flow of energy from the sun through the plants and animals in an ecosystem ● compare the pathway of energy from the sun through the organisms in two different environments Duration: 2 days	**Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **2.9: Think Like a Scientist: Compare and Contrast** **Engage**: ● Teacher-Led Demo: Students compare and contrast a metal and a paper chain ● Students recall what they learned about desert food chains **Explore:** ● Complete a class Venn Diagram comparing and contrasting a cat and a cow ● Set purpose and read text **Explain:** ● Compare and contrast food chains ● Evaluate model food chains ● Teach the dimensions **Elaborate:** ● Find out more about food chains **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	Vocabulary Extension Activity https://mysteryscience.com/ecosystems/mystery-1/food-chains-producers-consumers/119?vocab=true&t=student#slide-id-15955
Quiz 2		

2.10: Think Like a Scientist: Use Models Textbook p. 70-71 Online text p. 98-99 **NJSLS PS3.1** *Use models to describe that the energy in animal's food was once energy from the sun.* **Objective:** Students will be able to ● use a model to describe that energy in animals' food was once energy from the sun. Duration: 1 day	**Engage**: ● Use Photography: Students examine a photograph ● Students recall what they learned about food chains **Explore:** ● Think about models ● Ask a question **Explain:** ● Research an environment ● Assemble your model ● Analyze and revise your model ● Present your model ● Teach the dimensions **Elaborate:** ● Partners compare and contrast their food chains **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Print and digital resources for research Access to internet Crayons/ colored pencils

2.11: Desert Food Web Textbook p. 72-73 Online text p. 100-101 ***NJSLS LS2.A*** *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. 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.* **Objective:** Students will be able to ● describe the flow of energy from the sun through the organisms in a food web. Duration: 1 day	**Engage**: ● Use Photography: Students examine a photograph ● Students draw or describe a picture of a spider web **Explore:** ● Explore energy in a food web ● Set purpose and read text **Explain:** ● Define food web ● Identify producers and consumers in a food web ● Trace the flow of energy through a desert food web ● Teach the dimensions **Elaborate:** ● Find out more about energy in ecosystems **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Access to internet **Optional Mystery Science Activity**: See prep work, materials and handouts in this link as well. Why did dinosaurs go extinct? https://mysteryscience.com/ecosystems/mystery-7/food-webs-flow-of-energy/212?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity https://mysteryscience.com/ecosystems/mystery-7/food-webs-flow-of-energy/212?vocab=true&t=student#slide-id-16019
2.12: Decomposers Textbook p. 74-75 Online text p. 102-103 ***NJSLS LS2.A*** *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. 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.* **Objective:** Students will be able to ● describe the role of decomposers in food webs and in cycles of matter. Duration: 1 day	**Engage**: ● Use Video: Watch the video “Decomposing Fruit” ● Students share observations of mushrooms in the wild **Explore:** ● Discuss decomposers ● Set purpose and read text **Explain:** ● Define decomposers, fungi, and bacteria ● Describe the role of decomposers in cycles of matter ● Teach the dimensions **Elaborate:** ● FInd out about local fungi ● Find out about composting and decomposers **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Access to internet Reference books/field guides **Optional Mystery Science Activity**: Please use the link to access required student handouts and materials needed for these activities. Where do fallen leaves go? https://mysteryscience.com/ecosystems/mystery-3/decomposers-matter-cycle/95?code=NzQ0Nzk3NjI&t=student&chapter=all Do worms really eat dirt? https://mysteryscience.com/ecosystems/mystery-4/decomposers-nutrients-matter-cycle/215?code=NzQ0Nzk3NjI&t=student&chapter=all

2.13: Cycles of Matter Textbook p. 76-77 Online text p. 104-105 ***NJSLS LS2.B*** *Matter cycles between the air and the soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gasses and water from the environment and release waste matter (gas, liquid, or solid)* back into the environment. **Objective:** Students will be able to ● describe how matter cycles through an ecosystem and among the plants, animals, and microbes that live and die in the environment. Duration: 1 day	**Engage**: ● Use Photography: Students examine a photograph ● Graffiti Board: Students draw examples of a cycle **Explore:** ● Explore cycles of matter ● Set purpose and read text **Explain:** ● Describe the cycles of matter ● Describe the carbon dioxide-oxygen cycle ● Describe the nitrogen cycle ● Teach the dimensions **Elaborate:** ● Research how humans affect the carbon dioxide-oxygen cycle **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Access to internet **Optional Mystery Science Activity**: Do worms really eat dirt? https://mysteryscience.com/ecosystems/mystery-4/decomposers-nutrients-matter-cycle/215?code=NzQ0Nzk3NjI&t=student&chapter=all

2.14: Tallgrass Prairie Ecosystem Textbook p. 78-79 Online text p.106-107 **2.15: Grassland Populations and Communities** Textbook p. 80-81 Online text p. 108-109 ***NJSLS LS2.A*** *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. 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.* **Objective:** Students will be able to ● explain that organisms can survive only in environments in which their particular needs are met and describe	**2.14: Tallgrass Prairie Ecosystem** **Engage**: ● Use Video: Watch the video “Prairie and WIldlife” ● Students share how they get the things they need to live **Explore:** ● Explore ecosystems ● Set purpose and read text **Explain:** ● Define ecosystem ● View the animation “Ecosystems and Food Webs” ● Describe how the needs of organisms that live in a tallgrass prairie are met ● Explain that organisms survive only when their needs are met ● Teach the dimensions ● Read the articles “Elephant Orphanage” and “Saving Big Cats” ● Teach the dimensions **Elaborate:** ● Compare ecosystems ● Watch the video “Kelp Forest Ecosystem” **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **2.15: Grassland Populations and Communities** **Engage**: ● Use Photography: Students examine a photograph ● Students describe what they think a community is **Explore:** ● Think about populations and communities ● Set purpose and read text **Explain:** ● Define species and population ● Describe communities	ISN Access to Internet

the levels of organisms that make up an ecosystem. Duration: 1 day	● Teach the dimensions ● Watch the video "Interdependent Relationships in Ecosystems" ● Describe healthy ecosystems **Elaborate:** ● Research prairie dog communities **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	
<u>2.16: Investigate: Interactions in a Model Pond</u> Textbook p. 82-83 Online text p. 110-111 **NJSLS PS3.D** *The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter.* **Objective:** Students will be able to ● observe the way organisms live and survive in their ecosystem by interacting with other organisms and nonliving elements and describe the flow of energy derived from the sun through an ecosystem. Duration: 1 day	**Engage**: ● Use Video: Watch the video "Snail Eating" ● Think-Pair-Share: Students discuss organisms they might find in a pond **Explore:** ● Carry out the investigation **Explain:** ● Share and explain findings ● Teach the dimensions **Elaborate:** ● Observe models and look for changes in the ecosystem over time **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Access to Internet For Groups: Clear plastic bottle Sand Small rocks in a plastic cup Hand lens Elodea Snails For teacher: Sharp scissors Masking tape

2.17: Think Like a Scientist: Develop a Model Textbook p. 84-85 Online text p. 112-113 **NJSLS LS2.*1*** *Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.* **Objective:** Students will be able to ● develop a model to describe movement of matter among plants, animals, decomposers, and the environment. Duration: 1 day	**Engage**: ● Use Photography: Students examine a photograph ● Reread "Cycles of Matter" lesson **Explore:** ● Explore cycles ● Ask a question **Explain:** ● Research an ecosystem ● Assemble your model ● Analyze and revise your model ● Present your model ● Teach the dimensions **Elaborate:** ● Design a demonstration to find out more about the water cycle **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Access to internet Access to other reference material

2.18: Plants Invade! Textbook p. 86-87 Online text p. 118-119 **2.19: Think Like a Scientist Case Study: Animals Invade!** Textbook p. 88-91 Online text p. 120-123 ***NJSLS LS2.A*** *Newly introduced species can damage the balance of an ecosystem.* **Objective:** Students will be able to ● describe how newly introduced species can damage the balance of an ecosystem. Duration: 2 days	**2.18: Plants Invade!** **Engage**: ● Use Photography: Students examine a photograph ● Students describe weeds they have seen **Explore:** ● Predict what the lesson is about ● Set purpose and read text **Explain:** ● Describe invasive species ● Describe how newly introduced species can damage an ecosystem ● Teach the dimensions **Elaborate:** ● Describe local invasive plants **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks **2.19: Think Like a Scientist Case Study: Animals Invade!** **Engage**: ● Use maps: Students examine a map of fire ants in the U.S. ● Students discuss problems that can come from unwanted insects in your home **Explore:** ● Think about animal invasion ● Set purpose and read text **Explain:** ● Identify the problem ● Identify the solution ● Teach the dimensions **Elaborate:** ● Students find the main idea of the text **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Access to internet **Optional Mystery Science Activity**: Please use the link to access required student handouts and materials needed for these activities. Why do you have to clean a fish tank but not a pond? https://mysteryscience.com/ecosystems/mystery-5/ecosystems-matter-cycle/216?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity: https://mysteryscience.com/ecosystems/mystery-5/ecosystems-matter-cycle/216?vocab=true&t=student#slide-id-16036 **Optional National Geographic:** Stories in Science: To the Treetops Online text p. 124-125

Quiz 3		
<u>2.20: STEM Engineering Project: Design an Aquaponics System</u> Online text p. 114-117 ***NJSLS 3-5-ETS1-2:*** *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.* **Objective:** Students will be able to ● define the engineering problem they need to solve, including the criteria and constraints ● Design and build a model of an aquaponics system, within the constraints of the design ● Test the model and analyze their results to determine if it meets the criteria of the problem ● Use the results of their tests and ideas from their classmates to improve their design **Duration**: 2 days	**Engage**: ● Use Video: Students review the video clip of a snail eating ● Think-Pair-Share: Students discuss how living things get the things they need ● Define the problem **Explore:** ● Carry out the investigation ● Find a solution ● Test your solution ● Refine or change your solution **Explain:** ● Share and explain findings **Elaborate:** ● Investigate further aquaponics designs near you **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks ● Rubrics	ISN Access to Internet 2-liter plastic bottles, cut into pieces Bottle caps with 1 cm hole in the center a variety of wicking materials, at least 30 cm long Cotton string, yarn, plastic cord, shoelace, 30 cm strip of interlacing fabric coffee filters ½ cup of gravel, sand, or vermiculite scissors soil rulers Elodea snails small plants different color toothpicks 500 mL of clean water chart paper small plastic cups tap water poster board felt tip markers sticky notes cutting edge drill
Optional: **<u>2. 21: Science Career: Conservationist</u>** Textbook p. 92-93 Online text p. 126-129 **NJSLS** *Scientists study the natural and material world.* **Objective:** Students will be able to ● describe how a conservationist studies the natural world and works with other people to save natural resources. Duration: 1 day	**Engage**: ● Use Photography: Students examine a photograph ● Students share experiences working to save the environment **Explore:** ● Students predict what the lesson is about ● Set purpose and read text **Explain:** ● Describe the work of a conservationist ● Research water and ecosystems in the delta ● Describe the relationship between saltcedar and native plants ● Find out more about becoming a conservationist **Elaborate:** ● Research other careers in conservation ● Research local conservation projects **Evaluate:** "Wrap it Up!" ● Have students record their answers to the Wrap It Up questions in their science notebooks	ISN Access to internet Access to other print research material
Review		

Test		

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard 5-PS3-1: 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. [Clarification statement: Examples of models could include diagrams and flowcharts.]	
4.0	**Students will be able to:** ● Analyze other students' models in order to choose an exemplary model based upon criteria you develop. Defend your choice using criteria.
3.0	**Students will be able to:** Research several organisms in an environment that make up a food chain. Use it to develop a model that shows energy in animal's food was once energy from the sun. Analyze, revise, and present your model.
2.0	**Students will be able to:** ● Describe food chains, including producers and consumers. ● Describe how energy moves from the sun to plants. ● Describe how energy moves from producers to consumers. ● Describe how energy moves from consumers to other consumers. ● Create a model. ● Conduct research.
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard 5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]	
4.0	**Students will be able to:** ● Use research to construct, support, and defend an effective argument about the role of chlorophyll in the food-making process. Present and debate arguments with peers.
3.0	**Students will be able to:** ● Construct an effective argument by making a claim that in order to grow, plants need carbon dioxide from air and water. Cite multiple text evidence and data from investigations to support claim, including how and why plants use air and water. Evaluate, defend, and refine arguments with peers.
2.0	**Students will be able to:** ● Describe photosynthesis. ● Identify what plants need for growth. ● Describe how plants use air, water, and nutrients. ● Investigate plants growing without soil. ● Collect informational evidence from a text and quote accurately from the text. ● Make a claim and support it with evidence.
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]	
4.0	**Students will be able to:** ● Research to analyze how water moves through an ecosystem. Create a model to show how water cycles from nonliving environments to living organisms. Present and defend your model.
3.0	**Students will be able to:** ● Research several organisms that make up either a carbon dioxide-oxygen cycle or a nitrogen cycle. Use it to develop a model that shows matter moving through plants, animals, decomposers, and the environment. Analyze, revise, and present your model.
2.0	**Students will be able to:** ● Describe food chains, including producers, consumers, and decomposers. ● Describe how matter moves through a food chain. ● Create a model. ● Conduct research.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	● Allow students to work independently through investigations, “Think Like a Scientist,” and “Think Like an Engineer.” ● Use the “Elaborate” sections of the lessons to extend student thinking
Struggling Learners	● Refer to “Learning Assessment Masters” for premade charts for interactive science notebook to use with investigations, Science in a Snap, Think Like a Scientist, and Think Like an Engineer ● Pair with higher ability learners when appropriate ● Allow for small group and mini lessons with teacher ● Vary roles in heterogeneous groups to allow for different learning styles
English Language Learners	● Identify vocabulary sight words ● Use sentence frames to use vocabulary words correctly ● Describe information by using sentence stems ● Use charts to compare and contrast various aspects of the unit such as producers and consumers
Special Needs Learners	● Refer to IEP’s for modifications ● Refer to “Learning Assessment Masters” for premade charts for interactive science notebook ● Modify Investigations, Science in a Snap, Think Like a Scientist, and Think Like an Engineer by chunking and shortening expected responses and tasks. ● Provide small group instructions

Interdisciplinary Connections

Indicators:

RL.CR.2.1 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1)

W.5.8 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2),(5-PS1-3),(5-PS1-4)

W.WR.5.5. Establish a central idea about a topic, investigation, issue or event and use and quote several sources to support the proposed central idea.

W.SE.5.6. Gather relevant information from multiple valid and reliable print and digital sources; summarize or paraphrase information in notes and finished work, making note of any similarities and differences among ideas presented; and provide a list of sources.

W.WR.5.5. Establish a central idea about a topic, investigation, issue or event and use and quote several sources to support the proposed central idea.

(5-PS1-2),(5-PS1- 3),(5-PS1-4)
L.WF.5.2 - Demonstrate command of the conventions of writing, including those listed under grade four foundational skills.

L.KL.5.1 - Use knowledge of language and its conventions when writing, speaking, reading and listening.

L.VL.5.2 - Determine or clarify the meaning of unknown and multiple meaning academic and domain specific words and phrases based on grade 5, reading and content, choosing flexibility from a range of strategies.

SL.PE.5.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expression their own clearly.

SL.PI 5.;4 - Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Mathematics –
MP.2 MP.4 MP.5 5.NBT.A.1
5.NF.B.7 5.M.B.3, 5.M.B.2,
5.M.A.1
Reason abstractly and
quantitatively. (5-PS1-1),(5-
PS1-2),(5-PS1-)
Model with mathematics. (5-
PS1-1),(5-PS1-2),(5-PS1-)
Use appropriate tools strategically. (5-PS1-2),(5-PS1-3)
Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)
Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2)
Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)
Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)

Integration of 21st Century Skills

Indicators:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Understand and use technology systems.
- 8.1.5.A.1 Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

Select and use applications effectively and productively.
- 8.1.5.A.2 Format a document using a word processing application to enhance text and include graphics, symbols and/ or pictures.
- 8.1.5.A.3 Use a graphic organizer to organize information about a problem or issue. 8.1.5.A.4 Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data. 8.1.5.A.5 Create and use a database to answer basic questions.
- 8.1.5.A.6 Export data from a database into a spreadsheet; analyze and produce a report that explains the analysis of the data.

Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media. Communicate information and ideas to multiple audiences using a variety of media and formats. Develop cultural understanding and global awareness by engaging with learners of other cultures. Contribute to project teams to produce original works or solve problems.
- 8.1.2.C.1 Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media formats such as online collaborative tools, and social media.
- 8.1.5.C.1 Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings and present possible solutions, using digital tools and online resources for all steps.

Plan strategies to guide inquiry. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
- 8.1.5.E.1 Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.

Identify and define authentic problems and significant questions for investigation. Plan and manage activities to develop a solution or complete a project. Collect and analyze data to identify solutions and/or make informed decisions. Use multiple processes and diverse perspectives to explore alternative solutions
- 8.1.5.F.1 Apply digital tools to collect, organize, and analyze data that support a scientific finding.
- 8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

The characteristics and scope of technology.
- 8.2.5.A.1 Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.
- 8.2.5.A.2 Investigate and present factors that influence the development and function of a product and a system.

The core concepts of technology.
- 8.2.5.A.3 Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.

The relationships among technologies and the connections between technology and other fields
- 8.2.5.A.4 Compare and contrast how technologies have changed over time due to human needs and economic, political and/or cultural influences.
- 8.2.5.A.5 Identify how improvement in the understanding of materials science impacts

The cultural, social, economic and political effects of technology.
- 8.2.5.B.1 Examine ethical considerations in the development and production of a product through its life cycle.

The effects of technology on the environment.
- 8.2.5.B.2 Examine systems used for recycling and recommend simplification of the systems and share with product developers.
- 8.2.5.B.3 Investigate ways that various technologies are being developed and used to reduce

improper use of resources.

The role of society in the development and use of technology.
- 8.2.5.B.4 Research technologies that have changed due to society's changing needs and wants.
- 8.2.5.B.5 Explain the purpose of intellectual property law.

The attributes of design.
- 8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.
- 8.2.5.C.2 Explain how specifications and limitations can be used to direct a product's development.
- 8.2.5.C.3 Research how design modifications have led to new products.

The application of engineering design.
- 8.2.5.C.4 Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.
- 8.2.5.C.5 Explain the functions of a system and subsystems.

The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.
- 8.2.5.C.6 Examine a malfunctioning tool and identify the process to troubleshoot and present options to repair the tool.
- 8.2.5.C.7 Work with peers to redesign an existing product for a different purpose.

Apply the design process.
- 8.2.5.D.1 Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.
- 8.2.5.D.2 Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions

Use and maintain technological products and systems.

8.2.5.D.3 Follow step by step directions to assemble a product or solve a problem.

8.2.5.D.4 Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.

8.2.5.D.5 Describe how resources such as material, energy, information, time, tools, people and capital are used in products or systems.

Assess the impact of products and systems.

8.2.5.D.6 Explain the positive and negative effect of products and systems on humans, other species and the environment, and when the product or system should be used.

8.2.5.D.7 Explain the impact that resources such as energy and materials used in a process to produce products or system have on the environment.

Unit Title: UNIT 3: EARTH SCIENCE: Earth's Systems

Unit Duration: 23 instructional periods (includes 27 lessons, 3 quiz/review days, 1 unit review day and 1 test day)

Supplemental Reading Lessons in Ladders: Earth Science: *Power Up, Earth's Crazy Climate*

Unit Description: Students will study Earth Science by learning how Earth's 4 major systems, the geosphere, the hydrosphere, the atmosphere, and the biosphere interact to affect Earth's surface materials and processes. They will study the distribution of freshwater and saltwater on Earth, including the ocean ecosystem, and learn how the ocean shapes the land and influences climate. Finally, students will understand how human activity impacts land, vegetation, water, air, and space, and that humans are also working to protect these valuable resources.

**ADVANCED PREPARATION:
1) Gather small plants, soil, and gravel for Lesson 7: Interactions of Earth's Systems (p. 110), which occurs on Day 3

New Jersey Student Learning Standards:

5-ESS2-1.
Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

5-ESS2-2.
Describe and graph the amounts of saltwater and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

5-ESS3-1.
Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Indicators:

ESS2.A: Earth Materials and Systems
Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). 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 the landforms to determine patterns of weather. (5-ESS2-1)

ESS2.C: The Roles of Water in Earth's Surface Processes
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)

ESS3.C: Human Impacts on Earth Systems
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)

DESIRED RESULTS

Understandings:
Students will understand that…

- Earth's Materials and Systems
- Earth has 4 major systems: the hydrosphere, geosphere, atmosphere, and biosphere
- Earth's systems interact and affect Earth's materials and processes.
- Interactions of Earth's systems result in weather patterns.
- The ocean supports a variety of ecosystems and organisms.
- The ocean shapes landforms through erosion and deposition.
- The ocean influences climate.

Essential Questions:

- What are earth's major systems and how do they interact?
- How do Earth's systems affect weather patterns?
- How does the ocean support life?
- How does the ocean affect landforms and climate?
- How does the atmosphere affect landforms?
- Where on Earth are freshwater and saltwater found?
- What is the difference between renewable and nonrenewable resources?
- How do people affect the land, vegetation, water, air, and space?
- How are people working together to clean up and protect land, air, and water?

Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.
Models are helpful to show concepts that may be difficult to observe in real-time.

The Roles of Water in Earth's Surface Processes
- 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.
- Scientists display data using graphs.

Human Impacts on Earth's Systems
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- Individuals and communities are doing things to help protect Earth's resources and environments.
- Obtaining, evaluating, and communicating information is part of evaluating the quality and accuracy of ideas and methods in science.

Performance Tasks:
Investigate Lessons: Students will practice performance tasks in cooperative groups engaging in scientific inquiry.

- Investigate Interactions of Earth's Systems
- Model Interactions of Earth's Major Systems
- Describe how the geosphere, atmosphere, hydrosphere, and biosphere interact.

Investigate Graphing Water Data

- Graph the amounts and percentages of saltwater and freshwater on Earth
- Investigate Using Solar Energy: Investigate how solar energy can be used to make water cleaner.

PERFORMANCE EXPECTATIONS

Think like a Scientist: Students will develop a model, provide evidence, & identify materials cooperatively using science inquiry, providing evidence, analyzing data and drawing conclusions. All information will be recorded in Interactive Science Notebook and evaluated based on Teacher and Student Rubrics**.**

- Develop a Model
  - Describe an interaction between two of Earth's systems, or spheres
  - Explain interactions demonstrated in model
- Obtain and Combine Information
  - Work with a group to obtain information about ways Washington Township uses science ideas to protect Earth's resources and environment.
  - Combine information from investigation to communicate research to others.

Other Evidence:
Students will demonstrate their understandings through:
- Science Notebook
- Science in a Snap
- Think Like an Engineer Case Study: Tower of Trees
- Identify the benefits of trees in an urban environment;
- Describe methods that engineers have developed for growing trees in crowded cities
- Quizzes
- Unit Tests

Benchmarks: Benchmark will be given at the end of Unit 4.

LEARNING PLAN

Earth Materials and Systems NJSLS ESS2.1

Let's Explore: Online Text pages 132-133 Lesson 3.1 Earth's Major Systems Textbook pages- 98-99 Online text - p. 136-137 Lesson 3.2) The Geosphere, Textbook page 100 Online text page 138-139 Lesson 3.3 The Hydrosphere Textbook page 101-102 Online Text pages 140-141 **NJSLS *ESS2.A*: *Earth Materials and Systems:*** *Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes.* **Objective: Students will be able to** ● **identify Earth's major systems** ● **recognize that these systems interact and affect Earth's materials and processes** ● **describe the geosphere and hydrosphere and explain how each interacts with other systems to affect Earth's surface materials and processes** **Duration - 2 Days**	**Let's Explore and Lesson 3.1** **Engage:** Complete Let's Explore Activity ● Teacher Led Demo: Identify objects and how they relate to earth. ● Think Pair Share: What does this observation demonstrate about matter. **Explore**: Preview Photos ● Complete 4 square diagram ● Set a purpose to read **Explain** ● Identify and define Earth's four major systems. ● Recognize Earth's systems interact. ● Teach the dimensions **Elaborate** ● Extend thinking about Earth's systems. **Evaluate:** ● Complete the 'Wrap it Up" activity. ● Use teacher rubric. **Lesson 3.2** **Engage -** ● Introduce the Phenomenon -use photos ● Tap Prior Knowledge **Explore**: ● Define the geosphere ● Complete 4 Square Diagram ● Set purpose and read text. **Explain**: ● Describe the geosphere ● Connect the interactions in the geosphere. **Elaborate** ● Extend your thinking about interactions of geosphere and hydrosphere. ● Teach the dimensions **Evaluate:** ● Complete the 'Wrap it Up" activity. ● Use teacher rubric. **Lesson 3.3** **Engage -** ● Introduce the phenomenon using photography. ● Tap into prior knowledge **Explore:** ● Define the hydrosphere ● Complete 4 square diagram ● Set purpose and read text. **Explain:** ● Describe the hydrosphere ● Recognize that water in the hydrosphere is always moving. ● Connect interactions in the hydrosphere. ● Teach the dimensions **Elaborate:** ● FInd out more about the water cycle. ● Research saltwater and freshwater resources. **Evaluate**: ● Complete the 'Wrap it Up" activity ● Use teacher rubric.	Science Notebook Poster Board Access to the internet Optional Mystery Science Activity: When you turn on your faucet, where does the water go? See prep work, materials, and handouts in this link as well. https://mysteryscience.com/earth/mystery-3/groundwater-as-a-natural-resource/123?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity" https://mysteryscience.com/earth/mystery-3/groundwater-as-a-natural-resource/123?vocab=true#slide-id-15915

Lesson 3.4 -Atmosphere Textbook pages 104-105 Online text pages 142-143 **Lesson 3.5 - Biosphere** Textbook pages 106-107 Online text pages 144-145 **NJSLS *ESS2.A: Earth Materials and Systems:*** *Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere(water and ice), the atmosphere (air), and the biosphere (living things, including humans). 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 the landforms to determine patterns of weather.* **Objective: SWBAT describe the atmosphere and biosphere and explain how each interacts with other systems to affect Earth's surface materials and processes.** **Duration -1 day.**	**Lesson 3.4- The Atmosphere** **Engage:** ● Introduce the phenomena and tap into prior knowledge. **Explore:** ● Define the atmosphere. ● Complete 4 square diagram ● Set a purpose to read. **Explain:** ● Describe the atmosphere ● Recognize how the atmosphere interacts with other systems. ● Turn and talk ● Teach the dimensions. **Elaborate**: ● Extend thinking about the atmosphere. ● Complete literacy through Science activity. **Evaluate:** ● Complete exit slip. ● Complete the 'Wrap it Up" activity**.** ● Use teacher rubric. **Lesson 3.5** **Engage:** ● Introduce the phenomenon using photography. ● Tap into prior knowledge **Explore:** ● Explore the biosphere ● 4 square diagram ● Turn and talk ● Set a purpose and read text**.** **Explain:** ● Describe biosphere ● Explore featured photos. ● Recognize how the biosphere interacts with other spheres. ● Teach the dimensions. **Elaborate:** ● Extend thinning about the interaction between the biosphere and Earth's other systems. ● Research a biomes ● Literacy through Science **Evaluate:** ● Complete exit slip ● Complete "Wrap it Up" Activity. ● Use teacher rubric.	Interactive Science Notebook Access to internet Supplemental videos: https://www.youtube.com/watch?v=VMxjzWHbyFM https://www.youtube.com/watch?v=UXh_7wbnS3AOptional Mystery Science Activity: See prep work, materials and handouts in this link as well. Can we make it rain? https://mysteryscience.com/earth/mystery-3/groundwater-as-a-natural-resource/123?vocab=true#slide-id-15915 Vocabulary Extension Activity: https://mysteryscience.com/earth/mystery-4/water-cycle/124?vocab=true#slide-id-15920

Lesson 3. 6 Earth's Systems Interact Textbook pages 108-109 Online Text pages - 146-147 **Lesson 3. 7 (INVESTIGATE: Interactions of Earth's Systems** Textbook pages 110-11 Online Text - 149-150 **NJSLS *ESS2.A: Earth Materials and Systems:*** *Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). 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 the landforms to determine patterns of weather.* **Objective: Students will be able to** ● describe how the interactions of the Earth's systems result in weather patterns known as monsoons. ● model the interactions of Earth's major systems and describe how the geosphere, atmosphere, hydrosphere, and the biosphere interacts. *Lesson 7: part of 1 day for set- up; 5-10 minutes each week for 2 weeks or more for observation Duration - 1 day	**Lesson 3. 6** **Engage:** ● **I**ntroduce the phenomenon ● Tap prior knowledge **Explore:** ● Explore how Earth;s system interact. ● Complete 4 square diagram ● Set a purpose and read. **Explain:** ● Define monsoon ● Identify systems that cause monsoons ● Understand the effects of monsoons. ● Teach the dimensions. ● Diagram monsoons **Elaborate:** ● Find out more about monsoons. **Evaluate:** ● Complete "Wrap it Up" activity. ● Use teacher rubric. **Lesson 3.7:** **Engage:** ● **I**ntroduce phenomenon ● Tap prior knowledge**.** **Explore:** ● Carry out the investigation. **Explain**: ● Share and explain findings. **Elaborate**: ● Investigate further **Evaluate:** ● Complete "Wrap it Up" activity. ● Use teacher rubric.	Interactive Science Notebook For groups of 4: Safety goggles Clear 2-L bottle w/ top cut off Gravel Potting soil Plastic spoon Small plants Masking tape Observation activity sheets.

Lesson 3.8: Ocean Ecosystems Textbook pages 112-113 Online Text pages - 150-151 **NJSLS *ESS2.A: Earth Materials and Systems:*** *The ocean supports a variety of ecosystems and organisms, shapes, landforms, and influences climate.* **Objective: SWBAT describe a variety of ecosystems and organisms in the ocean.** Duration - 1 day	**Engage:** ● Introduce phenomenon using photos ● Tap prior knowledge **Explore:** ● Explore ocean ecosystems ● Think, pair share ● Complete 4 square diagram.. ● Set a purpose and read **Explain:** ● Define ocean ecosystems ● Make inferences about ocean ecosystems ● Teach the dimensions **Elaborate:** ● Research Coral Reefs ● Extend thinking of ocean ecosystems. **Evaluate:** ● Complete “Wrap it Up” Activity. ● Use teacher rubric.	Interactive Science Notebook Access to internet
Lesson 3. 9 (p. 114) The Ocean Shapes the Land Textbook pages 114-115 Online Text pages 152-153 **Lesson 3.10 -The Ocean Influences Climate** Textbook pages 116-117 Online Text pages 154-155 **NJSLS *ESS2.A*: *Earth Materials and Systems:*** *The ocean supports a variety of ecosystems and organisms, shapes, landforms, and influences climate.* **Objective: SWBAT** ● describe how the ocean shapes the land and explain the processes of erosion and deposition ● describe how the ocean influences climate and explain the difference between weather and climate. Duration - 1 day.	**Lesson 3. 9** **Engage**: ● Introduce phenomenon ● Tap prior knowledge. **Explore:** ● Explore ocean ecosystems ● Complete 4 square diagrams ● Set a purpose and read text. **Explain:** ● Review Earth’s systems and interactions. ● Describe ocean currents and waves ● Define erosion and deposition. ● Teach the dimensions. **Elaborate:** ● Five Why’s ● Research Barrier Islands ● Find out more about erosion at the shoreline. **Evaluate:** ● **"**Complete “Wrap it Up” activity. ● Use teacher rubric. **Lesson 3.10** **Engage**: ● Introduce phenomenon ● Tap prior knowledge. **Explore**: ● Explore how the ocean influences climate. ● Set a purpose and read text. **Explain**: ● Define and differentiate between weather and climate. ● Connect the influence of ocean currents to weather and climate. ● Teach the dimensions **Elaborate:** ● Find out more about Gulf Stream Temperatures E**valuate:** ● **"**Complete “Wrap it Up” activity. ● Use teacher rubric.	Interactive Science Notebook Access to Internet

Lesson 11 Landforms and Weather Patterns Textbook pages 118-119 Online text pages - 156-157 **Lesson 12 : The Atmosphere and Landforms** Textbook pages 120-121 Online Text Pages **NJSLS *ESS2.A Earth Materials and Systems:*** *Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). 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 the landforms to determine patterns of weather.* **Objective: Students will be able to** ● **describe how winds and clouds in the atmosphere interact with landforms to determine patterns of weather** ● **explain how processes in Earth's atmosphere interact with and change the shape of landforms.** **Duration - 1 day.**	**Lesson 3.11** **Engage**: ● Teacher led demo ● Tap prior knowledge **Explore:** ● Preview landform picture ● Complete 4 square diagram ● Set a purpose and read text. **Explain:** ● Analyze how mountains affect weather patterns. ● Turn and talk. ● Demonstrate understanding of rain shadows. ● Teach the dimensions. **Elaborate:** ● Research weather patterns ● Research farming in the rain shadow region. .**Evaluate:** ● Complete "Wrap it Up" activity. ● Use teacher rubric. **Lesson 3.12** **Engage**: ● Watch video ● Introduce phenomenon ● Tap prior knowledge. **Explore:** ● Preview Tufa Towers Pictures ● Complete 4 square diagram. ● Set a purpose and read text. **Explain:** ● Describe the interaction of atmosphere with landforms. ● Teach the dimensions. **Elaborate:** ● Find out more about Tufa Towers ● Research Limestone **Evaluate:** ● Complete "Wrap It Up!**"** activity. ● Use teacher rubric.	Interactive Science Notebook Access to Internet
The following lesson will demonstrate level of mastery for Goal 1: Use Nat Geo rubric in TG and goal and scale to monitor and assess		
Lesson 3.13 - Think like a Scientist Textbook pages 122-123 Online Text pages 160-161 **NJSLS *ESS2.1:*** *Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and*	**Engage**: ● Introduce phenomenon ● Tap prior knowledge. ● Construct an exemplary model **Explore:** ● Read text. ● With a group, design your model. **Explain:** ● With a group, analyze and revise your model. ● Present models to various groups. ● Teach the dimensions **Elaborate:** ● Two groups will compare and contrast their models. **Evaluate:** ● Teachers will use a rubric to assess student models.	Interactive Science Notebook For groups of 4: Assemble and set up areas of art materials that students choose for their models, including conceptual (posters, etc.) or physical

clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] **Objective: Students will be able to** ● **Work with a group to develop a model that describes and interaction between two of earth's systems, or spheres** ● **Explain the interactions demonstrated in their model** **2 days** Duration - 2 days		(terrariums, etc.).
Quiz 1		
The Roles of Water in Earth's Surface Processes: **NJSLS ESS2.2**		
The following lesson will demonstrate level of mastery for Goal 2: Use goal and scale to monitor and assess.		
<u>Lesson 3.14 - Water on Earth</u> Textbook pages 124-125 Online textbook pages 162-163 **<u>Lesson 3.15- Graphing Water on Earth</u>** Textbook pages 126-127 Online text pages 164-165 **NJSLS ESS2.C: *The Roles of Water in Earth's Surface Processes*** *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.* **Objective: Students will be able to** ● **recognize that nearly all of earth's available water is in in the ocean and identify sources of freshwater on Earth: glaciers, underground, streams, lakes, wetlands, and the atmosphere** ● **graph the amounts and percentages of saltwater and freshwater on Earth.** Duration - 2 days	**Lesson 3.14** **Engage**: ● Use photography to introduce phenomena. ● Tap prior knowledge **Explore:** ● Students use the photo "Graphic of Water on Earth" to explore water on Earth. ● Complete the four square diagram. ● Set a purpose and read text. **Explain:** ● Compare amounts of freshwater and saltwater on Earth. ● Define and describe glaciers. ● Teach the dimensions. **Elaborate**: ● Find out more about glaciers. ● Extend your thinking about how glaciers interact with the land. **Evaluate:** ● **"**Students complete the "Wrap it Up" activity. ● Use teacher rubric. **Lesson 3.15** **Engage**: ● Use diagrams to explore different type of graphs. ● Tap prior knowledge. ● Set a purpose and read the text. **Explore:** ● guide students through the investigation **Explain:** ● Students share final graphs with partners and other groups**.** **Elaborate:** ● Display data. ● Teach the dimensions. **Evaluate: "** ● Students use rubric to self evaluate their work. ● Complete "Wrap it Up" questions.	Interactive Science Notebook For groups of 4: Graph paper, optional: poster paper, construction paper, markers, rulers, protractors Optional Mystery Science Activity: How much water is in the world? See prep work, materials and handouts in this lesson as well. https://mysteryscience.com/earth/mystery-1/hydrosphere-water-distribution/122?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary extension activity. https://mysteryscience.com/earth/mystery-1/hydrosphere-water-distribution/122?vocab=true&t=student#slide-id-15888
QUIZ 2		

Human Impacts on Earth's Systems: NJSLS ESS3.1		
Lesson 3.16 - Earth's Resources Textbook pages 128-129 Online pages - 166-167 **NJSLS *ESS3.C: Human Impacts on Earth Systems:*** *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.* **Objective: Students will be able to** ● **identify air, plants, water, animals, coal, oil, and natural gas as natural resources** ● **Classify air, plants, water, and animals as renewable resources, and coal, oil, and natural gas as nonrenewable resources.** **Duration: 1 day**	**Engage**: ● Use photography to introduce phenomena. ● Tap prior knowledge. **Explore:** ● Explore Earth's resources. ● Complete 4 square activity. ● Set a purpose and read text. **Explain:** ● Identify natural resources. ● Classify natural resources. ● Teach the dimensions. **Elaborate:** ● Research local natural resources. ● Complete literacy through Science. **Evaluate: "** ● Students use rubric to self evaluate their work. ● Complete "Wrap it Up" questions.	Interactive Science Notebook Internet Access
Lesson 3.17 - Humans Impact Land Textbook pages 130-131 Online text pages: 168-169 **Lesson 3.18 - Humans Impact Vegetation.** Textbook pages 132-133 Online Text pages - 170-171 **Lesson 3.20- Humans Impact Water** Textbook pages 136-137 Online text pages - 174-175 **NJSLS ESS3.C: *Human Impacts on Earth Systems:*** *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.* **Objective: SWBAT identify ways in which human activities affect the land, vegetation, and water sources on Earth.** **Duration -1 day**	**Lesson 3.17** **Engage**:. ● Use photography to introduce the phenomenon. ● Tap into prior knowledge. **Explore:** ● Explore humans impact land. ● Complete 4 square diagram. ● Set a purpose and read text. **Explain:** ● Identify the impact of agriculture ● Identify the impact of business and industry. ● Teach the dimensions. **Elaborate:** ● FInd out more about humans and mining. **Evaluate:** ● Complete"Wrap It Up!" Activity. ● Use teacher rubric. **Lesson 3.18** **Engage**: ● Use photography to introduce the phenomenon. ● Tap into prior knowledge. **Explore:** ● Explore how humans impact vegetation. ● Complete 4 square diagram. ● Set a purpose and read text. **Explain:** ● Identify ways humans impact vegetation. ● Teach the dimensions. **Elaborate:** ● Extend thinking about deforestation. ● Research RainForest deforestation. **Evaluate** ● Complete Wrap it Up Activity. ● Use teacher rubric. **Lesson 3.19** **Engage:** ● Teacher led demo ● Tap Prior Knowledge **Explore**: ● Explore how humans impact water. ● Complete 4 square diagram.	**Interactive Science Notebook** **Access to Internet**

	● Set a purpose and read text**.** **Explain:** ● Identify the impact of human activity on freshwater resources. ● Identify the impacts of humans on ocean water. ● Complete literacy through Science. **Elaborate**: ● Find out more about irrigation. ● Extend your thinking about water. **Evaluate:** ● Complete Wrap it Up Activity ● Use teacher rubric.	
OMIT Lesson 19 (p. 134): INVESTIGATE: Plants and Pollution		

<u>Lesson 3.21 - Humans Impact Air</u> Textbook pages 138-139 Online Text pages: 176-177 **<u>Lesson 3.22 Humans Impact Space</u>** Textbook pages 140-141 Online Text pages : 178-179 **NJSLS *ESS3.C: Human Impacts on Earth Systems:*** *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.* **Objective: Students will be able to** ● **Identify ways that human activities impact air in Earth's atmosphere** ● **Describe ways that people are working together to clean up the air** ● **identify ways in which human activities impact space** **Duration - 1 day.**	**Lesson 3.21** **Engage**: ● Introduce the phenomenon with word web. ● Tap into prior knowledge. **Explore:** ● Discuss how humans impact air. ● Complete a 4 square diagram. ● Set a purpose and read. **Explain:** ● Connect human activities and air pollution ● Discuss featured photo ● Turn and talk activity. ● Describe ways humans can clean up air. ● Teach the dimension. **Elaborate:** ● Discuss more ways to clean up air. **Evaluate:** ● Complete "Wrap it Up" activity. ● Use teacher rubric. **Lesson 3. 22** **Engage**: ● Use photographs to introduce the phenomenon. ● Tap Prior Knowledge **Explore**: ● Explore how humans impact space. ● Complete 4 square diagram. ● Set a purpose and read text. **Explain:** ● Describe space junk. ● Explain dangers of space junk. ● Teach the dimensions. **Elaborate:** ● Research space junk. **Evaluate:** ● Complete "Wrap it Up" activity. ● Use teacher rubric.	**Interactive Science Notebook** **Internet access**
<u>Lesson 3.23 Protecting Land, Air, and Water</u> Textbook pages 142-143 Online textbook pages 180-181 **NJSLS *ESS3.C: Human Impacts on Earth Systems:*** *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.* **Objective: Students will be able to explain the importance of conserving Earth's resources and how recycling can help conserve resources.** **Duration - 1 day.**	**Lesson 3.23** **Engage**: ● Use photography to introduce phenomena.. ● Tap prior knowledge. **Explore:** ● Explore conservation of Earth;s Resources ● Set a purpose and read. **Explain:** ● Discuss why conservation is important. ● Identify ways to conserve resources. ● Complete Science in a Snap Activity. ● Teach the dimensions. **Elaborate:** ● Find out more about plastics. ● Complete literacy through science activity. **Evaluate:** ● Complete "Wrap it Up" activity. ● Use teacher rubric.	**Interactive Science Notebook** For **SCIENCE IN A SNAP** activity: Groups of 4 need a variety of plastic containers with numbered recycling codes.

Lesson 3.24 - Think Like an Engineer Case Study Textbook pages 144-145 Online text pages- 184-187 **NJSLS ESS3.C: Human Impacts on Earth Systems*:*** *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* . **Objective: Students will be able to** ● **Identify the benefits of trees in an urban environment** ● **Describe methods that engineers have developed for growing trees in crowded cities.** **Duration - 1 day**	**Lesson 3.24** **Engage**: ● Use video to introduce phenomenon. ● Tap prior knowledge. **Explore:** ● Explore environmental engineering. ● Complete 4 square diagram. ● Set a purpose and read. **Explain:** ● Describe Rachel Carson's work and influence. ● Teach nature of science. **Elaborate:** ● Research an environmental engineer of choice. **Evaluate: "** ● Complete Wrap It Up!" Activity. **Lesson 3.25** **Engage**: ● Use video to introduce phenomenon. ● Tap prior knowledge. **Explore:** ● Explore a vertical forest. ● Complete 4 square diagram. ● Set a purpose and read. **Explain** ● **I**dentify the problem. ● Identify the solution. ● Teach the dimensions. ● Milan's vertical rain forest. **Elaborate:** ● Device your own design system. ● Examine one city's solution. **Evaluate:** ● Complete Wrap It Up!" Activity. ● Use teacher rubric.	**Interactive Science Notebook** **Optional National Geographic** **Stories in Science - Environmental Engineer.** Textbook pages -n/a Online Textbook pages 182-183
Lesson 3.25 - Renewable Energy Resources. Textbook pages 148-149 Online Text pages: 188-189 **Lesson 3.26 - Investigate using solar energy.** Textbook pages 1501-151 Online Text pages 194-195 **NJSLS *ESS3.C: Human Impacts on Earth Systems:*** *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.* **Objective: Students will be able to** ● **Describe the difference between nonrenewable and renewable energy resources.** ● **Explain why it is important for humans to conserve energy resources.** ● **Describe alternative energy resources, such as solar, wind, and hydroelectric energy** ● **investigate how solar energy can be used to make water cleaner.** Duration - 2 days.	**Lesson 3.25** **Engage**: ● Use photography to explore phenomena. ● Tap prior knowledge. **Explore:** ● Explore renewable energy resources. ● Tap prior knowledge ● Complete 4 square diagram. ● Set a purpose and read. **Explain:** ● Differentiate between nonrenewable and renewable resources. ● Define renewable resources. ● Teach the dimension. **Elaborate:** ● Use video to explore solar and hydroelectric energy. **Evaluate:** ● Complete "Wrap it Up" Activity. ● Use teacher rubric. **Lesson 3.26** **Engage**: ● Teacher led demo. Introduce phenomena. ● Tap prior knowledge. **Explore:** ● Carry out investigation**.** **Explain:** ● Partner round robin. ● Teach the dimension. **Elaborate**: ● Present and share what was learned. **Evaluate:** ● Complete "Wrap it Up" Activity. ● Use teacher rubric.	**Interactive Science Notebook** For groups of 4: plastic container, small ball of clay, 9 oz. plastic cup, measuring cup, water, sandy soil, spoon, plastic wrap, rubber band, rock, safety goggles for all

Quiz 3		
Lesson 3.27 **Obtain and combine information.** Online text pages - 196-197 **NJSLS *5-ESS3-1*.: *Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.*** **Objective: Students will be able to** ● **Work with a group to obtain information about ways Washington Township uses science ideas to protect Earth's resources and environment** ● **Combine information from their research to communicate their results to others** **1 day**	**Engage**: ● Use photography to introduce phenomena.. ● Tap into prior knowledge. ● Introduce the investigation. **Explore:** ● Carry out the investigation. ● Analyze and organize research. ● Teach the dimensions. ● Teach the Nature of Science. **Explain:** ● Communicate information. ● Teach the dimensions. **Elaborate:** ● Invite a community member to speak to the class.. **Evaluate:** ● Teachers will use a rubric to assess student models. ● Complete Wrap It Up Activity.	**Interactive Science Notebook** Students will work in groups of 3-4 with specific roles. Have on hand a list of local groups that work to protect and conserve resources such as energy, water, or vegetation.
Lesson 3.28 **STEM Research Project: Energize** Online text pages - 190-193 **NJSLS *5-ESS3-1*.: *Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.*** **Objective: Students will be able to** ● **Describe one product or system with wind and solar energy** ● **Obtain, evaluate, and communicate information from books and other reliable media to explain phenomena or solutions related to both wind and solar** **1 day**	**Engage**: ● Use photography to introduce phenomena.. ● Tap into prior knowledge. ● Select a topic **Explore:** ● Plan and conduct research ● Teach the dimensions. **Explain:** ● Draft your report. ● Teach the dimensions. ● Present your report **Elaborate:** ● Students create word webs ● Brainstorm questions to ask a local utility company **Evaluate:** ● Teachers will use a rubric to assess student models. ● Complete Wrap It Up Activity.	**Interactive Science Notebook** .
Review		
Test		

Unit Learning Goal and Scale
(Level 2.0 reflects a minimal level of proficiency)

UNIT 3: EARTH SCIENCE GOAL 1 (Resource: Think Like a Scientist p. 122) Standard: 5-ESS2-1. Earth Materials and Systems
Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of
mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

4.0	**Students will be able to:** ● Analyze how adding a third or fourth sphere to the model would affect the interaction with the other two. ● Analyze and revise the model to make it more explicitly show an interaction between systems and explain how the revision improves the model. ● Compare and contrast the model with another's. Provide constructive feedback**.**
3.0	**Students will be able to:** ● Develop a model that describes an interaction between two of Earth's systems. Explain the interaction demonstrated in the model. ● Design a model, gather the materials, and carry out the steps**.**
2.0	**Students will be able to:** ● Define *model*. ● Describe how one of Earth's systems interacts with another.

	● Recognize that Earth's major systems interact. ● Identify Earth's 4 major systems and describe each: – *geosphere, biosphere, hydrosphere, atmosphere*
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

UNIT 3: EARTH SCIENCE GOAL 2 (Resource: Investigate p. 126)
Standard: 5-ESS2-2. The Roles of Water in Earth's Surface Processes
Describe and graph the amounts of saltwater and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]

4.0	**Students will be able to:** ● Generate other ways to display the data in an original graph of choice, such as a 3-dimensional format, and create it. Compare and evaluate the effectiveness of the two graphs in demonstrating Earth's water distribution. ● Utilize the information in the graph to generate possible solutions for the shortage of fresh water in certain parts of the world.
3.0	**Students will be able to:** ● Use evidence from the graph to describe the distribution of water on Earth. ● Graph the amounts and percentages of saltwater and freshwater on Earth using a data chart.
2.0	**Students will be able to:** ● Interpret a data chart. ● Read and create a circle graph and bar graph. ● Describe the following types of reservoirs: oceans, ice caps, glaciers, groundwater, surface water. Identify which sources are saltwater and which are freshwater.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

UNIT 3: EARTH SCIENCE GOAL 3 (Resource: p. 152 Think Like a Scientist: Obtain and Combine Information)
Standard: 5-ESS3-1. Human Impacts on Earth's Systems
Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

4.0	**Students will be able to:** ● Analyze and evaluate other groups' research and presentations to provide feedback about which information was most effective in communicating ways people protect Earth and offer suggestions. ● Generate a list of interview questions that you could ask a community member who is active in protecting Earth's resources. Interview this person and summarize findings.
3.0	**Students will be able to:** ● Combine information from the investigation to analyze data, draw a conclusion, and communicate results to others. ● Obtain information (plan and research) about ways individual communities use science ideas to protect Earth's resources and environment.

2.0	**Students will be able to:** ● Identify examples of ways that people impact earth's systems. ● Work with a group to plan a project, access sources of information, and gather data.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	● Allow students to work independently through Investigations, "Think Like a Scientist", and "Think Like an Engineer" activities. ● Use the "Elaborate" sections of the lesson to extend student thinking. Some "Elaborate" activities can be extended over several days or used as long-term independent or small group projects, to demonstrate higher-level understanding of each of the following performance expectation standards: 1) p. 122 Develop a Model: Students can work with other groups to compare and contrast their models, provide constructive feedback, and replace or incorporate a different sphere into their models and explain new interactions between the spheres. 2) p. 126 Describe and Graph Water Data: Students can determine additional ways to display the data, be challenged to display data in an original graph of their choice, and present original graphs to classmates for analysis. 3) p. 152 Obtain and Combine Information: Have students work together to find a person in the community who is active in conservation, prepare a list of interview questions they could ask, conduct the interview, and summarize what they have learned.
Struggling Learners	● Refer to "Learning Assessment Masters" for pre-made charts for interactive science notebook to use with Investigations, Science in a Snap, Think Like a Scientist, and Think like an Engineer. ● Pair with higher ability learners when appropriate. ● Allow for small groups and mini-lessons with teacher. ● Vary roles in heterogeneous groups to allow for different learning styles. ● For Reading Support, use Reading Connection: Determine Word Meaning activities on pp. 99 (prefixes *atmo-, geo-, hydro-, bio-),* 103 (*condense, evaporate*), 115 (*erode, deposit*), 125 (*reservoir*), 133 (*deforestation, vegetation*), and 149 (*hydroelectric*). ● p. 107 for Extra Support, ask: How is Earth's biosphere different from the geosphere, hydrosphere, and atmosphere? ● P. 113 for Extra Support, have students make a word map about ocean ecosystems, and draw three other circles, and write in the names of the ecosystems on p. 113. ● Reading Support: p. 105 Guide students in understanding how two or more main ideas of a text are supported by key details. ● Reading Support: p. 107, 109 Guide students in explaining the relationships or interactions between living things in the biosphere, and among Earth's systems using text information. ● Reading Support: p. 11 Guide students in summarizing the procedure in *Investigate*. ● Reading Support: p. 113, 135 Guide students in determining main ideas of text and how they are supported by details. ● Reading Support: p. 117, 119, 139, 141 Guide students in quoting accurately from the text when explaining what the text says explicitly.
English Language Learners	● p. 99: vocabulary activities for *hydrosphere*, *geosphere*, *biosphere*, *atmosphere* ● p. 109: vocabulary activities for *monsoon* ● p. 119: complete sentence frames using *weather* and *landform* content from lesson ● p. 125: vocabulary activities for *wetland*, *landform*, *underground, groundwater* ● p. 129: classification activity for *renewable* and *nonrenewable resources* ● p. 137: concept map activities for *pollutants, fertilizers, waste, detergents, oil, humans impact on water, dam streams, irrigate crops, waste from home* ● p. 147: sentence completion activities for *leaves, stems, twigs, dust, ash, smoke, brick, concrete, steel, asphalt* ● p. 149: vocabulary activities for *solar energy, solar panels, renewable energy, nonrenewable energy, wind turbines, dams*

Special Needs Learners	● Use Reading and Vocabulary Support Activities listed under Struggling Learners and ELL. ● Refer to IEPs for modifications ● Refer to "Learning Assessment Masters" for pre-made charts for interactive science notebook ● Provide copies of written notes for studying and reviewing purposes ● Provide vocabulary definitions and study guides for assessments well ahead of time ● Simplify written responses by providing sentence starters, fill-ins, partially completed diagrams, or selected responses as needed ● Provide reading support as specified in IEP ● Modify Investigations, Science in a Snap, Think Like a Scientist, and Think Like an Engineer by chunking and shortening expected responses and tasks ● Provide small-group and individual instruction as needed

Interdisciplinary Connections

Indicators:

ELA/Literacy:

RI.CR.5.1 - Quote accurately from an informational text when explaining what the text says explicitly and make relevant connections when drawing inferences from the text.

RL.CR.5.1 - Quote accurately from a literary text, when explaining what the text says explicitly and make relevant connections when drawing inferences from text.

W.W.4.5 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2),(5-PS1-3),(5-PS1-4)

W.WR.5.5. Establish a central idea about a topic, investigation, issue or event and use and quote several sources to support the proposed central idea.

W.SE.5.6. Gather relevant information from multiple valid and reliable print and digital sources; summarize or paraphrase information in notes and finished work, making note of any similarities and differences among ideas presented; and provide a list of sources.

W.WR.5.5. Establish a central idea about a topic, investigation, issue or event and use and quote several sources to support the proposed central idea.

L.VL.5.2 - Determine or clarify the meaning of unknown and multiple meaning academic and domain specific words and phrases based on grade 5 reading and content, choosing flexibility from a range of strategies.

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS2-1),(5-ESS2-2)

SL.PE.5.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expression their own clearly.

SL.PI 5.;4 - Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Mathematics:

MP.2 Reason abstractly and quantitatively. (5-ESS2-1),(5-ESS2-2),(5-ESS3-1)

MP.4 Model with mathematics. (5-ESS2-1),(5-ESS2-2),(5-ESS3-1)

5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1)

Integration of 21st Century Skills

Indicators:

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Understand and use technology systems.

- 8.1.5.A.1 Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

Select and use applications effectively and productively.

- 8.1.5.A.2 Format a document using a word processing application to enhance text and include graphics, symbols and/ or pictures.
- 8.1.5.A.3 Use a graphic organizer to organize information about a problem or issue. 8.1.5.A.4 Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data. 8.1.5.A.5 Create and use a database to answer basic questions.
- 8.1.5.A.6 Export data from a database into a spreadsheet; analyze and produce a report that explains the analysis of the data.

Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media. Communicate information and ideas to multiple audiences using a variety of media and formats. Develop cultural understanding and global awareness by engaging with learners of other cultures. Contribute to project teams to produce original works or solve problems.

- 8.1.2.C.1 Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media formats such as online collaborative tools, and social media.
- 8.1.5.C.1 Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings and present possible solutions, using digital tools and online resources for all steps.

Plan strategies to guide inquiry. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.

- 8.1.5.E.1 Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.

Identify and define authentic problems and significant questions for investigation. Plan and manage activities to develop a solution or complete a project. Collect and analyze data to identify solutions and/or make informed decisions. Use multiple processes and diverse perspectives to explore alternative solutions

- 8.1.5.F.1 Apply digital tools to collect, organize, and analyze data that support a scientific finding.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

The characteristics and scope of technology.

- 8.2.5.A.1 Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.
- 8.2.5.A.2 Investigate and present factors that influence the development and function of a product and a system.

The core concepts of technology.

- 8.2.5.A.3 Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.

The relationships among technologies and the connections between technology and other fields

- 8.2.5.A.4 Compare and contrast how technologies have changed over time due to human needs and economic, political and/or cultural influences.
- 8.2.5.A.5 Identify how improvement in the understanding of materials science impacts

The cultural, social, economic and political effects of technology.

- 8.2.5.B.1 Examine ethical considerations in the development and production of a product through its life cycle. The effects of technology on the environment.
- 8.2.5.B.2 Examine systems used for recycling and recommend simplification of the systems and share with product developers.
- 8.2.5.B.3 Investigate ways that various technologies are being developed and used to reduce improper use of resources.

The role of society in the development and use of technology.

- 8.2.5.B.4 Research technologies that have changed due to society's changing needs and wants.
- 8.2.5.B.5 Explain the purpose of intellectual property law.

The attributes of design.

- 8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.
- 8.2.5.C.2 Explain how specifications and limitations can be used to direct a product's development.
- 8.2.5.C.3 Research how design modifications have led to new products.

The application of engineering design.

- 8.2.5.C.4 Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.
- 8.2.5.C.5 Explain the functions of a system and subsystems.

The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.

- 8.2.5.C.6 Examine a malfunctioning tool and identify the process to troubleshoot and present options to repair the tool.
- 8.2.5.C.7 Work with peers to redesign an existing product for a different purpose.

Apply the design process.

- 8.2.5.D.1 Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.
- 8.2.5.D.2 Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions.

Use and maintain technological products and systems.

- 8.2.5.D.3 Follow step by step directions to assemble a product or solve a problem.
- 8.2.5.D.4 Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.
- 8.2.5.D.5 Describe how resources such as material, energy, information, time, tools, people and capital are used in products or systems.

Assess the impact of products and systems.

- 8.2.5.D.6 Explain the positive and negative effect of products and systems on humans, other species and the environment, and when the product or system should be used.
- 8.2.5.D.7 Explain the impact that resources such as energy and materials used in a process to produce products or systems have on the environment.

Unit 4: Earth Science: Space Systems: Stars and the Solar System

Unit Duration: 19 instructional periods (includes 16 lessons, 2 quiz/review days, 1 unit review day, 1 test day, 1 benchmark day)

Supplemental Reading Lessons in Ladders: Earth Science: *Exploring Above and Beyond*

Unit Description: In this Earth Science unit, students will study Earth in its relationship to the moon, sun, and other stars in the universe. They will learn that Earth exerts a gravitational force on objects which pulls them towards the planet's center. They will understand that the sun is a star which appears brighter and larger than other stars because of its distance from Earth. Students will learn that the Earth, sun, and moon move in a system, and that it is this relationship that causes observable patterns such as shadows, day and night, and seasonal appearance of stars**.** They will think and act as scientists when they support an argument with evidence, data, or models and represent data in graphical displays**.**

Desired Results

NJSLS Standard(s):
Students who demonstrate understanding can:
5-PS2-1.: Types of Interactions
Support an argument that the gravitational force exerted by Earth on objects is directed down.
5-ESS1-1.: The Universe and its Stars
Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.
5-ESS1-2.: Earth and the Solar System
Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Indicators:
PS2.B: Types of Interactions - The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5- PS2-1)
ESS1.A: The Universe and its Stars - 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)
ESS1.B: Earth and the Solar System - The orbits of Earth around the sun and of 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. (5-ESS1-2)

Understandings:	Essential Questions:
Students will understand that… **Types of Interactions:** • The gravitational force exerted by Earth is directed downward towards Earth's center. • Scientists use data, evidence, or models to support an argument. **The Universe and its Stars:** ● 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. ● Differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. ● Scientists use data, evidence, or models to support an argument. **Earth and the Solar System:** ● The Earth, sun, and moon move in space as a system. This causes observable patterns. ● Earth rotates on its axis once every 24 hours to cause the day/night cycle. ● The apparent motion of the sun across the sky is caused by Earth's rotation. ● Earth's orbit around the sun causes observable patterns such as: – *shadows over time* – *the sequence of seasons over time* – *the positions of the stars at different times of the year* ● *Scientists represent data in graphical displays to reveal patterns that indicate relationships.* ● *The moon's rotation on its axis and orbit around Earth causes the same side to always face Earth.* ● *The moon's orbit around Earth causes patterns of moon phases.* ● *The Earth's rotation causes the apparent movement of the moon across the sky.*	● Why do objects fall towards Earth? ● How do scientists support an argument? ● What is a star? ● Why does the sun seem brighter and larger than other stars in the sky? ● How do Earth, the moon, and the sun move as a system? ● Why do the sun, other stars, and moon appear to change positions in the sky? ● What causes observable patterns such as shadows, day/night, seasons, positions of stars throughout the year, and moon phases? ● How and why do scientists represent data in graphical displays?

Assessment Evidence

Performance Tasks:
Investigate Lessons: Students will practice performance tasks in cooperative groups engaging in scientific inquiry.

- Investigate: Gravity
  - Gather data to support an argument that the gravitational force exerted by Earth on objects is directed down.
- Investigate: Apparent Brightness
  - Investigate to show that the apparent brightness of a light-emitting object varies with distance from the observer
  - Use data from the investigation to support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.
- Sunlight and Shadows:
  - Demonstrate that the rotation of earth about an axis causes observable changes in patterns of shadows over time
  - Collect and record information using tools, including a meter stick and a clock.
- Graph Hours of Daylight
  - Represent data in a graph to reveal patterns of seasonal changes in the length of day and night.
- Moon Phases
  - Collect and analyze data to identify sequences and predict patterns of change in the observable appearance of the moon over time.
  - Collect information about the moon's phases by making detailed observations.

Performance Expectations:
Think Like a Scientist: Students will develop a model, provide evidence, & identify materials cooperatively using inquiry, providing evidence, analyzing data and drawing conclusions. All information will be recorded in Interactive Science Notebook and evaluated based on Teacher and Student Rubrics**.**

- Represent Data
  - Represent data in a graphical display that reveals the patterns of change in the seasonal appearance of some stars in the night sky.
  - Use the graphical display to describe patterns of Stars.

Other Evidence:

Students will demonstrate their understandings through:

- Science Notebook
- Science in a Snap
- Science Career
- Quizzes
- Unit Test

Benchmarks: Benchmark will be given at the end of Unit 4.

Learning Plan

Let's Explore Online text p. **4.1: Gravity on Earth** Textbook p. 154-155 Online text p. 198-199 **4.2 - Investigate Gravity** Textbook pages - 156-157 Online Text pages - 200-201 ***NJSLS PS2.1 - Support an argument that the gravitational force exerted on Earth on objects is directed down.*** **Objective: Students will be able to gather data to support that the gravitational force exerted by Earth on objects is directed down.** **Duration:** 2 days	**Lesson 4.1** **Engage**: ● Teacher led demo to introduce the phenomenon. ● Tap prior knowledge ● Watch a video of a skydiver. **Explore:** ● Explore gravity on Earth ● Complete 4 square diagram. ● Set purpose and read text **Explain:** ● Define gravity ● Understand the concept of down. ● Connect gravity to objects on Earth. ● View animation of gravitational force. ● Teach the dimensions **Elaborate:** ● Research how gravity affects spacecrafts. **Evaluate:** ● Complete Wrap It Up Activity. ● Use teacher rubric. **Lesson 4.2** **Engage**: ● Teacher led demo to introduce the phenomenon. ● Tap prior knowledge ● Explain the investigation **Explore:** ● Complete the investigation. **Explain:** ● Shar and explain. ● Teach the dimensions. **Evaluate:** ● Complete Wrap It Up Activity ● Evaluate using rubrics.	Interactive Science Notebook Poster Board Access to the internet Interactive Science Notebook For groups of 4: Unsharpened pencil, eraser, coin, crumpled paper, rubber ball, safety goggles for all Optional Mystery Science Activity: Why is gravity different on other planets? https://mysteryscience.com/solarsystem/mystery-2/gravity/290?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary extension activity: https://mysteryscience.com/solarsystem/mystery-2/gravity/290?r=74479762&vocab=true#slide-id-16158

Lesson 4.3 - Earth Sun and Moon Textbook pages 158-159 Online text pages - **NJSLS *PS2.B: Types of Interactions*:** *The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)* **Objective: Students will be able to** ● **Describe how the Earth, sun, and moon move in space and as a system** ● **Relate gravitational force to the motions of Earth, the sun, and moon in space.** Duration - 1 day	**Engage**: ● Introduce the phenomenon through role play. ● Tap prior knowledge **Explore:** ● Explore the Sun, Moon and Earth ● Set a purpose and read **Explain:** ● Connect the movements. ● Describe systems in space. ● Partner talk ● Teach the dimensions." **Elab**orate: ● Research Earth's Revolution. **Evaluate:** ● Complete Wrap it Up activity. ● Use teacher rubric.	Interactive Science Notebook Access to Internet Optional Mystery Science Activity: Could there be life on other planets? https://mysteryscience.com/solarsystem/mystery-2/gravity/290?r=74479762&vocab=true#slide-id-16158 Vocabulary extension: https://mysteryscience.com/solarsystem/mystery-3/star-brightness-habitable-planets/294?r=74479762&vocab=true#slide-id-16170
The Universe and its Stars NJSLS ESS1.1	**The following lesson will demonstrate level of mastery for Goal 2:**	Use goal and scale to monitor and assess.
QUIZ 1		

Lesson 4.4 **STEM Space Station Project: Toys on Earth and in Space** Online text pages - 206-209 **NJSLS *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*** **Objective: Students will be able to** ● **Define the engineering design problem they need to solve** ● **Design and build a model that meets the criteria and constraints of the problem** ● **Plan and carry out fair tests** ● **Revise and improve the model based on criteria and constraints** **2 days**	**Engage**: ● Use video to introduce phenomena.. ● Tap into prior knowledge. ● Define the problem **Explore:** ● Find a solution ● Test your solution ● Teach the dimensions. ● Refine your solution **Explain:** ● Share and explain findings ● Teach the dimensions. **Elaborate:** ● Brainstorm ways for other toys to work in microgravity **Evaluate:** ● Teachers will use a rubric to assess student models. ● Complete Wrap It Up Activity.	**Interactive Science Notebook** **Each group of 4:** 2 2-m sections of 4 cm diameter foam pipe insulation glass marble masking tape 1 simple toy .
Lesson 4.5 - Our Star: The Sun Textbook Pages 160-161 Online Text pages - 202-203 **Lesson 4.6 Investigate Apparent Brightness.** Textbook Pages 162-163 Online Text pages - 214-215 **NJSLS *5-ESS1-1.: The Universe and its Stars:*** *Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]* **Objective: Students will be able to** ● **Investigate to show that the apparent brightness of a light-emitting object varies with distance from the observer** ● **Use data from the investigation to support an argument that differences in the apparent brightness of the sun compared to other stars is due to**	**Use Lesson 5 Investigation to drive the purpose for gathering information from Lesson 4.** **Lesson 4.4** **Engage**: ● Introduce the phenomenon through video - The Sun ● Tap prior knowledge **Explore:** ● Explore tour Star, the Sun ● Complete 4 square diagram. ● Set a purpose and read **Explain:** ● Contrast the Sun with other Stars. ● Describe the brightness of stars. ● Investigate to understand how distance affects the perspective of size. ● Complete Science in a Snap **Elaborate:** ● Find out more about the Sun. **Evaluate:** ● Complete Wrap it Up activity ● Use teacher rubric. **Lesson 4.5** **Engage**: ● Introduce the phenomenon through photography ● Tap prior knowledge **Explore:** ● Read the investigation. ● Complete the investigation**.** **Explain:** ● Analyze the date. ● Engage in an argument using evidence. ● Evaluate the activity. ● Teach the dimensions." **Elab**orate: ● Investigate apparent brightness.	Interactive Science Notebook Access to internet Science in a Snap: Each group of 4 needs a round object such as a soccer ball, metric ruler For groups of 4: 3 penlights, tape, tissue paper, meter stick **Optional Activities: Only found in online teacher text.** Matp the Moon Ride Sally Ride. Toys in Space Optional Mystery Science Activity: See prep work, materials, handouts in this link as well. How can the sun help us explore other planets? https://mysteryscience.com/solarsystem/mystery-1/solar-system-sun-brightness/908?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary extension: https://mysteryscience.com/solarsystem/mystery-1/solar-system-sun-

their relative distances from the Earth. Duration - 2 days	**Evaluate:** ● Complete Wrap it Up activity ● Teacher rubric.	brightness/908?r=74479762&vocab=true#slide-id-16142
<u>Lesson 4.7 - Day and Night</u> Textbook pages 164-165 Online Text pages **NJSLS *ESS1.B: Earth and the Solar System:*** *The orbits of Earth around the sun and of the moon around Earth, together with he 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. (5-ESS1-2)* **Objective: Students will be able to** ● **Explain that Earth rotates on its axis once every 24 hours to cause the day/night cycle** ● **Demonstrate that Earth rotates on its axis once every 24 hours to cause the day/night cycle.** Duration - 1 day	**Engage:** ● Hands on activity to introduce the phenomenon. ● Tap prior knowledge. **Explore:** ● Explore day and night. ● Complete 4 square diagram. ● Set a purpose and read**.** **Explain** ● Explain Earth's rotation causes day and night. ● Review Science in a Snap ● Complete investigation. ● Teach the dimensions. ● Watch video Sunrise from Space **Elaborate:** ● Research Earth;s rotation. **Evaluate**: ● Complete Wrap it Up Activity. ● Teacher rubric.	Interactive Science Notebook Science in a Snap activity: Each group of 2 needs a globe that rotates, masking tape, a flashlight Optional Mystery Science Activity: See prep work, materials, handouts in this link as well. How fast does the Earth spin? https://mysteryscience.com/astronomy/mystery-1/day-night-earth-s-rotation/378?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity: https://mysteryscience.com/astronomy/mystery-1/day-night-earth-s-rotation/378?vocab=true#slide-id-16110

Lesson 4.8 - Apparent Motion Textbook pages 166-167 Online Text pages 218-219 **Lesson 4.9 - Investigate Sunlight and Shadows** Textbook pages 168-169 Online text pages - 220-221 **NJSLS *ESS1.B: Earth and the Solar System:*** *The orbits of Earth around the sun and of 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. (5-ESS1-2)* **Objective:** **Students will be able to** □ **Explain what causes the apparent motion of the sun across the sky** □ **Demonstrate the different positions of the sun at different times of day.** □ **Demonstrate that the rotation of earth about an axis causes observable changes in patterns of shadows over time** □ **Collect and record information using tools, including a meter stick and a clock.** **2 days:** since shadow observation needs to occur each hour throughout the day, you may want each class to take their own time's data and share across the grade; Elaborate activities from previous lessons or time-lapse shadow videos can be used to fill-in any extra time Duration - 2 days	Lesson 4.7 **Engage:** ● Show a video to introduce the phenomenon. ● Tap prior knowledge. **Explore:** ● Explore Apparent motion ● Partner Talk. ● Complete 4 square diagram. ● Set a purpose and read**.** **Explain** ● Define apparent motion.. ● Explain that the Earth's rotation causes ● apparent motion. ● Science in a Snap ● Teach the dimensions. ● Watch video Apparent Star Motion. **Elaborate:** ● Explore shadows. ● Explore cultures. **Evaluate**: ● Complete Wrap it Up Activity. ● Teacher rubric. Lesson 4.8 **Engage:** ● Teacher demonstration to introduce the phenomenon. ● Think, pair, share. ● Tap prior knowledge. **Explore:** ● Carry out the investigation. **Explain** ● Share and explain findings. ● Group Collaboration.. ● Teach the dimensions. ● Watch video Sunrise from Space **Elaborate:** ● Investigate Further ● Explore on your own. **Evaluate**: ● Complete Wrap it Up Activity. ● Teacher rubric.	Interactive Science Notebook For Science in a Snap: Each group of 2 needs a directional compass, outdoor landmark- such as tall, thin tree, a flagpole, or a basketball hoop mounted on a pole. Investigation groups of 4: Marble-size lump of clay, poster board, unsharpened pencil, colored pencil, masking tape or rocks, meter stick Optional Mystery Science lesson. How can the sun tell you the season? See prep work, materials and handouts in this link as well. https://mysteryscience.com/astronomy/mystery-3/seasonal-changes-shadow-length/76?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity: https://mysteryscience.com/astronomy/mystery-3/seasonal-changes-shadow-length/76?vocab=true#slide-id-16122

Lesson 4.10 - Revolution and the Seasons Textbook page 170-171 Online Text pages - 222-223 **This lesson is 2 days** to include extra time for understanding and supporting videos **NJSLS *ESS1.B: Earth and the Solar System:*** *The orbits of Earth around the sun and of 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. (5-ESS1-2)* **Objective: Students will be able to recognize that the orbit of Earth around the sun causes observable patterns such as the sequence of seasons over time.** **Duration - 1 day**	**Engage:** ● Teacher demo to introduce the phenomenon. ● Tap prior knowledge. **Explore:** ● Explore seasons ● Think, pair, share. ● Complete 4 square diagram. ● Set a purpose and read. **Explain** ● Identify causes of seasons on Earth. ● Describe the seasons. ● Teach the dimensions. **Elaborate:** ● Compare and contrast seasons. ● Seasonal changes based on ● latitude. **Evaluate**: ● Complete Wrap it Up Activity. ● Exit slip questions. ● Teacher rubric.	Interactive Science Notebook Access to Internet Optional Mystery Science Activity: Who set the first clock? See prep work, materials, handouts in this link as well. https://mysteryscience.com/astronomy/mystery-2/earth-s-rotation-daily-shadow-patterns/74?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary Extension Activity: https://mysteryscience.com/astronomy/mystery-2/earth-s-rotation-daily-shadow-patterns/74?vocab=true#slide-id-16116

The following lessons (10-11) will demonstrate level of mastery for Goal 3: Use goal and scale to monitor and assess.		
Lesson 4.11 - Graph hours of Daylight. Textbook pages 172-173 Online Text pages -224-225 **NJSLS *5-ESS1-2.: Earth and the Solar System:*** *Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]* **Objective: Students will be able to represent data in a graph to reveal patterns of seasonal changes in the length of day and night.** Duration - 1 day	**Engage:** ● Use photography to introduce the phenomenon. ● Tap prior knowledge. **Explore:** ● Complete the activity. ● Carry out the investigation. **Explain** ● Report and explain findings.. ● Teach the dimensions. **Elaborate** ● Jigsaw Activity **Evaluate**: ● Complete Wrap it Up Activity. ● Use teacher rubric.	Interactive Science Notebook For each student: Graph paper Optional Mystery Science Activity: Why do the stars change with the seasons? https://mysteryscience.com/astronomy/mystery-4/seasonal-patterns-earth-s-orbit/75?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary extension activities: https://mysteryscience.com/astronomy/mystery-4/seasonal-patterns-earth-s-orbit/75?vocab=true#slide-id-16125

Lesson 4.12 - Earth's Orbit Textbook pages 174-175 Online text pages 226-227 **Lesson 4.13 - Represent Data** Textbook pages 176-177 Online Text pages - 228-229 **NJSLS *5-ESS1-2.: Earth and the Solar System:*** *Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]* **Objective: Students will be able to** ☐ **describe how Earth's orbit around the sun causes observable patterns in the positions of the stars at different times of the year.** ☐ **Represent data in a graphical display that reveals the patterns of change in the seasonal appearance of some stars in the night sky.** ☐ **Use the graphical display to describe patterns of stars.** Duration - 2 days	**Lesson 4.11** **Engage:** • Use photography to introduce the phenomenon. • Tap prior knowledge. **Explore**: • Observe the diagram • Complete 4 square activity • Tap into prior knowledge.. **Explain** • Define constellations • Describe constellations. • Analyze changing constellations • Teach the dimensions. **Elaborate** • Extend thinking about constellations. • Complete virtual lab. **Evaluate:** • Complete Wrap it Up Activity. • Use teacher rubric. **Lesson 4.12** **Engage**: • Use photography to introduce the phenomenon. • Tap prior knowledge. **Explore:** • Identify ways to represent data. **Explain** • Analyze the data. • Represent data in graphical displays. • Teach the dimensions.. **Elaborate** • Investigate constellations further. **Evaluate:** • Complete Wrap it Up Activity. • Use teacher rubric	Interactive Science Notebook Access to Inte
Lesson 4.14 - Moons Motions Textbook pages 178-179 Online textbook pages - 230-231 **Lesson 4.15 - Moon Phases** Textbook pages 180-181 Online Text pages - 232-233 **NJSLS *ESS1.B: Earth and the Solar System:*** *The orbits of Earth around the sun and of 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. (5-ESS1-2)* **Objective: Students will be able to** • **describe the moon's motions, including rotation, orbiting of Earth, and apparent movement across the sky.** Duration - 1 day	**Lesson 4. 14:** **Engage**: • Use video to introduce the phenomenon. • Tap prior knowledge. **Explore:** • Explore the moon. • Complete 4 square diagram. • Set a purpose and read. **Explain** • Describe moon motions. • Demonstrate moon motions. • Teach the dimensions.. **Elaborate** • Extend your knowledge about the moon. **Evaluate:** • Complete Wrap it Up Activity. • Use teacher rubric **Lesson 4.15:** **Engage**: • Use photography to introduce the phenomenon. • Tap prior knowledge. **Explore:** • Explore moon phases. • Complete 4 square diagram. • Set a purpose and read. **Explain** • Explain why moon phases occur. • Describe moon phases.	Interactive Science Notebook Optional Mystery Science Activity: Why does the moon change shape? See prep work, materials and handouts in this link as well. https://mysteryscience.com/astronomy/mystery-5/moon-phases-lunar-cycle/77?code=NzQ0Nzk3NjI&t=student&chapter=all Vocabulary extension activity: https://mysteryscience.com/astronomy/mystery-5/moon-phases-lunar-cycle/77?vocab=true#slide-id-16133

	● Sequence moon phases. ● Teach the dimensions. **Elaborate** ● Analyze moon phases. **Evaluate** ● Complete Wrap it Up Activity. ● Use teacher rubric	

<u>Lesson 4.16 - Investigate Moon Phases.</u> Textbook pages 182-183 Online text pages - 234-235 **NJSLS *ESS1.B: Earth and the Solar System:*** *The orbits of Earth around the sun and of 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. (5-ESS1-2)* **Objective: Students will be able to** ● **Collect and analyze data to identify sequences and predict patterns of change in the observable appearance of the moon over time.** ● **Collect information about the moon's phases by making detailed observations.** Duration - 1 day	**Engage**: ● Use photography to introduce the phenomenon. ● Tap prior knowledge. **Explore:** ● Explain investigation. ● Carry out investigation. **Explain** ● Share and explain findings. ● View the video. **Elaborate:** ● Investigate further. **Evaluate** ● Complete Wrap it Up Activity. ● Use teacher rubric	Interactive Science Notebook For groups of 3: Craft stick or pencil, foam ball lamp with 60- watt bulb (for class), masking tape
Quiz 2		
<u>Optional</u> **<u>Science Career</u>** Textbook pages 184-185 Online Text pages - 236-239 **NJSLS** *Scientific knowledge assumes order and consistency in natural systems.* **Objective: Students will be able to connect the concepts of astronomy with the career of an astrobiologist and science educator** Duration - 2 days	**Engage**: ● Use photography to introduce the phenomenon. ● Tap prior knowledge. **Explore:** ● Complete 4 square diagram ● Set a purpose and read. **Explain** ● Define Astrobiologist ● Describe the work of an Astrobiologist. ● Find out more about being an astrobiologist. ● Background on Brendon Mullen. ● Teach the dimensions. **Elaborate:** ● Research other careers in Astrobiology. ● FInd out more about planets outside of the solar system. **Evaluate** ● Complete Wrap it Up Activity. ● Teacher rubric.	Interactive Science Notebook Access to Internet

Review		
Test		
Benchmark		

Unit Learning Goal and Scale
(Level 2.0 reflects a minimal level of proficiency)

Unit 4: EARTH SCIENCE: SPACE GOAL 1 **(Resource Investigate: Gravity)**

Standard: 5-PS2-1: Types of Interactions

Support an argument that the gravitational force exerted by Earth on objects is directed down. [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]

4.0	**Students will be able to:** ● Design an investigation to test whether a lighter or heavier object falls faster. Make a prediction, perform the test, use your results to make an argument, and use evidence from the investigation to support your argument.
3.0	**Students will be able to:** ● Using data, evidence, or models, support the argument that the force of Earth's gravity on an object is directed down.
2.0	**Students will be able to:** ● Explain why objects fall towards Earth. ● Define gravity. ● In a given activity, identify the argument and identify the support for the argument.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit 4: EARTH SCIENCE: SPACE Goal 2 **(Resource Investigate: Apparent Brightness)**

Standard: 5-ESS1-1: The Universe and its Stars

Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]

4.0	**Students will be able to:** ● Design an investigation to argue that stars with <u>different</u> brightness may appear dimmer or brighter than they actually are due to their distances from Earth. Make a prediction, conduct the investigation, and use data, evidence, or models from the investigation to support the argument.
3.0	**Students will be able to:** ● Use data, evidence, or models to support the argument that stars with the <u>same</u> brightness appear dimmer or brighter than they actually are due to their distances from the Earth.
2.0	**Students will be able to:** ● Explain why the sun appears much larger and brighter than other stars. ● Describe *apparent brightness*. ● In a given activity, identify the argument and identify the support for the argument.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit 4: EARTH SCIENCE: SPACE Goal 3 **(Resource Investigate: Graph Hours of Daylight)**

Standard: 5-ESS1-2.: Earth and the Solar System

Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

4.0	**Students will be able to:** ● Analyze differences of seasonal changes in daylight hours in different locations. Research the daylight hours of a location close to the equator. Graph the data and use it to describe the changes in daylight over time. Compare this data to the location farther from the equator. Use information from both graphs to describe differences. Explain the reason for this phenomenon.
3.0	**Students will be able to:** ● Represent data in a graph to reveal patterns of seasonal changes in the length of day and night in a specific location. Use information from the graph to describe the changes of daylight hours over time.
2.0	**Students will be able to:** ● Describe how the number of daylight hours changes with the seasons. Explain why daylight hours change in the Northern and Southern Hemispheres through the seasons. ● Explain what causes seasons. ● Explain what causes the repeated pattern of day and night. ● Create and interpret different types of graphs (bar, line, circle), and identify the titles, ranges, and what the numbers represent. Explain any patterns they reveal.

1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students

Advanced Learners	● Allow students to work independently through Investigations, "Think Like a Scientist", and "Think Like an Engineer" activities. ● Use the "Elaborate" sections of the lesson to extend student thinking. Some "Elaborate" activities can be extended over several days or used as long-term independent or small group projects, to demonstrate higher-level understanding of each of the following performance expectation standards: 1) p. 156 Support an Argument: Students can extend the investigation by predicting which hits the ground first when dropping two objects at the same time, testing prediction, and explaining results. 2) p. 162 Support an Argument: Students will design an investigation to argue that stars with <u>different</u> brightness may appear dimmer or brighter than they actually are due to their distances from Earth. Students will make a prediction, conduct the investigation, and use data, evidence, or models from the investigation to support the argument. 3) p. 172 Represent Data in Graphical Displays: Students can: Analyze differences of seasonal changes in daylight hours in different locations. Research the daylight hours of a location close to the equator. Graph the data and use it to describe the changes in daylight over time. Compare this data to the location farther from the equator. Use information from both graphs to describe differences. Explain the reason for this phenomenon.

Struggling Learners	● Refer to "Learning Assessment Masters" for pre-made charts for interactive science notebook to use with Investigations, Science in a Snap, Think Like a Scientist, and Think like an Engineer. ● Pair with higher ability learners when appropriate. ● Allow for small groups and mini lessons with the teacher. ● Vary roles in heterogenous groups to allow for different learning styles. ● For Reading Support, use Reading Connection: Determine Word Meaning activities on p. 159 (*revolve, revolution, gravitational force)* and *p.* 181 (*waxing, waning).* ● p. 187 for Extra Support, have pairs of students look up definitions for *biologist, chemist, astronomer*, and *physicist*, and write a sentence describing work of each. ● Reading Support: p. 155, 171 Guide students in quoting accurately from the text when explaining what the text says explicitly. ● Reading Support: p. 161 Guide students in drawing on information from multiple print or digital sources as they research. ● Reading Support: p. 165 Have students use the text to explain some of the interactions that result in the phenomena we know as day and night. ● Reading Support: p. 167,179 Guide students in understanding how two or more main ideas of a text are supported by key details. ● Reading Support: p. 169 Guide students in summarizing the procedure in *Investigate*. ● Reading Support: p. 183 Guide students in explaining the interactions that caused the appearance of phases on the foam ball.
English Language Learners	● Unit Vocabulary*: gravity, gravitational force, revolve, revolution, star, solar system, apparent brightness, rotate, rotation, axis, constellation, apparent motion* ● p. 187: Vocabulary activities for *astrobiologist, scientific communication, studies, survive, work, won, present, biologist, chemist, physicist, engineer*
Special Needs Learners	● Use Reading and Vocabulary Support Activities listed under Struggling Learners and ELL. ● Refer to IEPs for modifications. ● Refer to "Learning Assessment Masters" for pre-made charts for interactive science notebook. ● Provide copies of written notes for studying and reviewing purposes.

	● Provide vocabulary definitions and study guides for assessments well ahead of time. ● Simplify written responses by providing sentence starters, fill-ins, partially completed diagrams, or selected responses as needed. ● Provide reading support as specified in IEP. ● Modify Investigations, Science in a Snap, Think Like a Scientist, and Think Like an Engineer by chunking and shortening expected responses and tasks ● Provide small-group and individual instruction as needed.

Interdisciplinary Connections

ELA/Literacy -

RI.CR.5.1 - Quote accurately from an informational text when explaining what the text says explicitly and make relevant connections when drawing inferences from the text.
RL.CR.2.1 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1)
W.W.4.5 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2),(5-PS1-3),(5-PS1-4)
W.WR.5.5. Establish a central idea about a topic, investigation, issue or event and use and quote several sources to support the proposed central idea.
W.SE.5.6. Gather relevant information from multiple valid and reliable print and digital sources; summarize or paraphrase information in notes and finished work, making note of any similarities and differences among ideas presented; and provide a list of sources.
W.WR.5.5. Establish a central idea about a topic, investigation, issue or event and use and quote several sources to support the proposed central idea.
SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS1-2)
SL.PE.5.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expression their own clearly.
SL.PI 5.;4 - Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Mathematics -
MP.2 Reason abstractly and quantitatively. (5-ESS1-1),(5-ESS1-2)
MP.4 Model with mathematics. (5-ESS1-1),(5-ESS1-2)
5.NBT.A.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-ESS1-1)
5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2)

Integration of 21st Century Skills

Indicators:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Understand and use technology systems.
- 8.1.5.A.1 Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

Select and use applications effectively and productively.
- 8.1.5.A.2 Format a document using a word processing application to enhance text and include graphics, symbols and/ or pictures.
- 8.1.5.A.3 Use a graphic organizer to organize information about a problem or issue. 8.1.5.A.4 Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data. 8.1.5.A.5 Create and use a database to answer basic questions.
- 8.1.5.A.6 Export data from a database into a spreadsheet; analyze and produce a report that explains the analysis of the data.

Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media. Communicate information and ideas to multiple audiences using a variety of media and formats. Develop cultural understanding and global awareness by engaging with learners of other cultures. Contribute to project teams to produce original works or solve problems.
- 8.1.2.C.1 Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media formats such as online collaborative tools, and social media.
- 8.1.5.C.1 Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings and present possible solutions, using digital tools and online resources

for all steps.

Plan strategies to guide inquiry. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.

- 8.1.5.E.1 Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.

Identify and define authentic problems and significant questions for investigation. Plan and manage activities to develop a solution or complete a project. Collect and analyze data to identify solutions and/or make informed decisions. Use multiple processes and diverse perspectives to explore alternative solutions

- 8.1.5.F.1 Apply digital tools to collect, organize, and analyze data that support a scientific finding.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

The characteristics and scope of technology.

- 8.2.5.A.1 Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.
- 8.2.5.A.2 Investigate and present factors that influence the development and function of a product and a system.

The core concepts of technology.

- 8.2.5.A.3 Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.

The relationships among technologies and the connections between technology and other fields

- 8.2.5.A.4 Compare and contrast how technologies have changed over time due to human needs and economic, political and/or cultural influences.
- 8.2.5.A.5 Identify how improvement in the understanding of materials science impacts

The cultural, social, economic and political effects of technology.

- 8.2.5.B.1 Examine ethical considerations in the development and production of a product through its life

cycle. The effects of technology on the environment.

- 8.2.5.B.2 Examine systems used for recycling and recommend simplification of the systems and share with product developers.
- 8.2.5.B.3 Investigate ways that various technologies are being developed and used to reduce improper use of resources.

The role of society in the development and use of technology.

- 8.2.5.B.4 Research technologies that have changed due to society’s changing needs and wants.
- 8.2.5.B.5 Explain the purpose of intellectual property

law. The attributes of design.

- 8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.
- 8.2.5.C.2 Explain how specifications and limitations can be used to direct a product’s development.
- 8.2.5.C.3 Research how design modifications have led to new products.

The application of engineering design.

- 8.2.5.C.4 Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.
- 8.2.5.C.5 Explain the functions of a system and subsystems.

The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.

- 8.2.5.C.6 Examine a malfunctioning tool and identify the process to troubleshoot and present options to repair the tool.
- 8.2.5.C.7 Work with peers to redesign an existing product for a different purpose.

Apply the design process.

- 8.2.5.D.1 Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.
- 8.2.5.D.2 Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions.

Use and maintain technological products and systems.

- 8.2.5.D.3 Follow step by step directions to assemble a product or solve a problem.
- 8.2.5.D.4 Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.

8.2.5.D.5 Describe how resources such as material, energy, information, time, tools, people and capital are used in products or systems.

Assess the impact of products and systems.

8.2.5.D.6 Explain the positive and negative effect of products and systems on humans, other species and the environment, and when the product or system should be used.

8.2.5.D.7 Explain the impact that resources such as energy and materials used in a process to produce products or system have on the environment.