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 Student Learning 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):	**4**

Duration:	*Full Year:*		*Semester:*	X	*Marking Period:*	1-2

Course Description:

The Washington Township School District fourth 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, the Next Generation Science Standards, and the New Jersey Student Learning 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 fourth grade are taken specifically from the Next Generation Science Standards:

- Unit 1: Physical Science-Sources of Energy
- Unit 2: Physical Science-Uses of Energy
- Unit 3: Physical Science-Waves
- Unit 4: Life Science-Structure, Function, and Information Processing
- Unit 5: Earth Science-Earth's Systems: Processes that Shape The Earth
- Unit 6: Earth Science-Natural Hazards
- Engineering Design (Integrated Throughout)

Grading Procedures:

Major- 60%

Minor- 40%

Primary Resources:

National Geographic Texts/Teacher's Manual

Student Laptops

Student Notebooks

Additional Research Materials

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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Under the Direction of:	Linda Thomas, Elementary Supervisor and Gretchen Gerber, Director

Written: August 2017

Revised: July 2024 by Jacquelyn Tiger-Williams

BOE Approval:

Unit Title: Unit 1: Physical Science-Sources of Energy

Unit Description: Students will be introduced to energy. They will learn about speed, motion, sound, light, and heat and how they are transferred into energy.

Unit Duration: 14 Days

Desired Results

New Jersey Student Learning Standard(s):

4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.

4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.

Indicators:

PS3.A: Definitions of Energy

- The faster a given object is moving, the more energy it possesses. (4-PS3-1)
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2, 4-PS3-3)

PS3.B: Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2, 4-PS3-3)
- Light also transfers energy from place to place. (4-PS3-2)
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2, 4-PS3-4)

PS3.C: Relationship Between Energy and Forces

- When objects collide, the contact forces energy transfer so as to change the objects' motions. (4-PS3-3)

Understandings: *Students will understand…*	**Essential Questions:**
▯ The faster a given object is moving, the more energy it possesses. ▯ Energy can be moved from place to place by moving objects or through sound, light, or electric currents. ▯ Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. ▯ Light also transfers energy from place to place. ▯ Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. ▯ When objects collide, the contact forces energy transfer so as to change the objects' motions.	● How can energy move from place to place? ● How does the speed of a moving object relate to the amount of energy it possesses? ● How does energy transfer and/or change when objects collide? ● How does the energy of motion transform into sound? ● How is energy transferred from the sun to Earth? ● What is heat?

Assessment Evidence

Performance Tasks:

Investigate Lessons-Students will practice performance tasks in cooperative groups engaging in scientific steps of an investigation.

- Lesson 1.2: *Speed* (textbook p. 6-7, online text p. 24-25)
  Observe that the speed of a ball increases with the amount of energy they give it when they roll it.
- Lesson 1.4: *Motion* (textbook p. 10-11, online text p. 28-29)
  Predict that the energy of a ball will increase and the ball will move faster when it is hit harder.
- Lesson 1.6: *Sound* (textbook p.14-15, online text p. 32-33)
  Observe that salt grains will vibrate with more energy when more sound energy is directed toward them.
- Lesson 1.8: *Light* (textbook p. 18-19, online text p. 36-37)
  Observe that color fades on areas of paper exposed to light.
- Lesson 1.10: *Heat* (textbook p. 22-23, online text 42-43)
  Observe that a cup with the warmest water will melt butter the fastest.

Other Evidence:

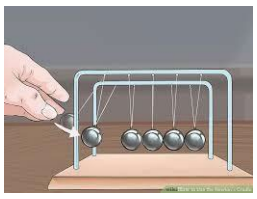
- Science Notebook Entries
- Quizzes
  - After Lesson 4 -- "Motion"
  - After Lesson 10 -- "Heat"
- Unit Test

Benchmarks: Physical Science Benchmark will be given after Unit 3.

Learning Plan

Resources: National Geographic Learning: Exploring Science Teacher's Guide, Student Text Books, Interactive eBook and Website, Laptops, Student Science Notebooks

Learning Activities:

Lesson and Duration	Activities	Materials/ Suggested Resources
1.1: Batter Up! (textbook p. 4-5, online text p. 22-23) **NJSLS 4-PS3-1, 4- PS3-2, 4-PS3-3** PS3.A: Definition of Energy **Objective(s):** ● Explain how energy can be moved from place to place. ● Connect the speed of a moving object to the amount of energy it possesses. **Duration:** 1 Day	**Engage:** Share knowledge about baseball and throwing a ball. **Explore:** Preview & Read text **Explain:** ● Define **energy** ● Explain how energy can move ● Connect speed to energy **Elaborate:** *Science Notebook* ● Identify three examples of objects moving energy from place to place **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and four square diagram	● piece of paper for each student
1.2: Speed ***INVESTIGATE** (textbook p. 6-7, online text p. 24-25) **NJSLS 4-PS3-1** **Objective(s):** ● Use evidence to explain how the speed of an object relates to its energy. **Duration:** 1 Day	**Engage:** Discuss ways to move energy from hands to wall. **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations & conclusions **Elaborate:** Present & discuss guiding questions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	Each Group of 2: ● Wiffle ball ● Stop watch Teacher: ● Masking tape
1.3: Hit the Ball (textbook p. 8-9, online text 26-27) **NJSLS 4-PS3-2, 4- PS3-3** PS3.B: Conservation of Energy and Energy Transfer, PS3.C: Relationship between Energy and Forces **Objective(s):** ● Recall that moving objects possess energy. ● Describe the transfer of energy that occurs when moving objects collide. **Duration:** 1 Day	**Engage:** Discuss what impact of collision feels like **Explore:** Preview & Read text **Explain:** ● Review motion ● Define **transfer** ● Describe an energy transfer during a collision **Elaborate:** *Science Notebook* ● Research the physics of baseball collisions ● Extend thinking about energy and collisions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	cars crashing tackling bowling pins Baseball Physics Websites for student research (students can explore on own or you can provide sites) Newton's Cradle or Newton's Cradle website 

1.4: Motion (Collisions) ***INVESTIGATE** (textbook p. 10-11, online text p. 28-29) **NJSLS 4-PS3-3** **Objective(s):** ● Ask questions about the changes in energy that occur when objects collide. ● Predict outcomes about the changes in energy that occur when objects collide. **Duration:** 1 Day	**Engage:** Discuss what happens to the energy of a ball after it collides with a bat/hockey stick/pool stick (can reference pool video provided) **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations & conclusions **Elaborate:** ● Repeat step 3 of investigation using different amounts of force ● Present & discuss guiding questions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	Breaking Shot in Pool Each group of 2: ● Wiffle ball ● Wiffle bat Teacher: ● Masking tape OPTIONAL: Digital Wrap-Up in Interactive E-book OPTIONAL: Mystery Science Task (each set of partners needs scissors, scotch tape, aluminum foil, 1 18 oz cup, several 3 oz cups, sticker labels, marbles)
QUIZ 1		
1.5: Sounds of the Game (textbook p. 12-13, online text p. 30-31) **NJSLS 4-PS3-2, 4- PS3-3** 4-PS3.A: Definitions of Energy, 4-PS3.B: Conservation of Energy and Energy Transfer **Objective(s)**: ● Recognize that sound possesses energy ● Make an inference about energy conservation during a collision **Duration**: 1 Day	**Engage:** Discuss what students hear with their eyes closed **Explore:** Preview & Read text **Explain:** ● Connect sound to energy ● Describe how energy is conserved **Elaborate:** *Science Notebook* ● Discuss what happens when hands clap ● Research how musical instruments transfers sound energy and record findings in notebook ● Research how sound energy bounces off some objects and is absorbed by others **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions and 4 square diagram	1 rubber band Musical Instruments/Sound Websites for student research (students can explore on own or you can provide sites) Sounds Bouncing vs Sounds Absorbing Websites for student research (students can explore on own or you can provide sites)
1.6: Sound ***INVESTIGATE** (textbook p. 14-15, online text p. 32-33) **NJSLS 4-PS3-2** **Objective(s)**: ● Observe evidence that sound transfers energy **Duration**: 1 Day	**Engage:** Share experiences when noises produced vibrations (teacher can model with vibrating device such as electric toothbrush) **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations & conclusions **Elaborate:** Present & discuss guiding questions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: 1 vibrating device such as electric toothbrush Each group of 4: ● Clear, plastic 9 oz cup ● Paper towel tube ● Pinch of salt ● Rubber band ● 6x6 in. piece of plastic wrap Teacher: ● Extra paper towel tube ● scissors

1.7: The Sun's Light (textbook p. 16-17, online text 34-35) **NJSLS 4-PS3-2, 4- PS3-3** 4-PS3.A: Definitions of Energy, 4-PS3.B: Conservation of Energy and Energy Transfer **Objective**: ● Describe light energy ● Recognize that light transfers energy from place to place **Duration**: 1 Day	**Engage:** Share evidence that the sun give energy (can reference photos of sunny day and overcast day provided) **Explore:** Preview & Read text **Explain:** ● Describe light ● Recognize that light transfers energy **Elaborate:** *Science Notebook* ● Describe what happens to transformed light energy ● Research ways in which light is produced (transformed) **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	Sunny Day Photograph Overcast Day Photograph Ways Light is Produced Websites for student research (students can explore on own or you can provide sites)
1.8: Light ***INVESTIGATE** **(OUTDOOR LAB-NEED SUNNY DAY!)** (textbook p. 18-19, online text 36-37) **NJSLS 4-PS3-2** **Objective**: ● Make observations to provide evidence that energy can be transferred from place to place by light **Duration**: 1 Day	**Engage:** *OPTIONAL: Introduce and discuss different light sources.* Review how light transfers energy and discuss how someone can demonstrate light energy transfer **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations & conclusions **Elaborate:** Present & discuss guiding questions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: 3 light fixtures and an incandescent, compact fluorescent, and LED bulb (turn on at least 15 minutes before start of class) Each group of 2: ● 8 1/2 x 11 in. piece of construction paper ● Assortment of small classroom objects
1.9: Heat it Up! (textbook p. 20-21, online text) **NJSLS 4-PS3-1, 4- PS3-2, 4-PS3-3** 4-PS3.A: Definitions of Energy, 4-PS3.B: Conservation of Energy and Energy Transfer **Objective**: ● Recognize that heat is the transfer of thermal energy ● Define heat as the transfer of thermal energy **Duration**: 1 Day	**Engage:** *OPTIONAL: Introduce and discuss mug of hot tea/water.* Discuss evidence that light is transformed into thermal energy **Explore**: Preview & Read text. **Explain:** ● Recognize that heat is the transfer of thermal energy ● Define heat & thermal energy **Elaborate:** *Science Notebook* ● Research convection, conduction, and radiation: identify examples from photo provided in text ● Extend thinking to identify what is happening to the snow in photos provided in text **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: mug of hot tea/water, heat up before class Convection, Conduction, and Radiation Websites for student research (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book

1.10: Heat ***INVESTIGATE** (textbook p. 22-23, online text p. 42-43) **NJSLS 4-PS3-2** **Objective**: ● Make observations to provide evidence that energy can be transferred from place to place by heat **Duration**: 1 Day	**Engage:** Share examples of thermal energy transfers to their bodies (can reference a pair of tongs or photo of tongs to discuss how the silicone allows you to safely handle hot foods) **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Compare observations **Elaborate:** Design experiment by modifying Investigation **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: 1 pair of tongs with a silicone handle OR silicone tips Tongs Photograph Each group of 4: ● 3 clear plastic cups 9 oz ● 3 identical metal spoons ● 3 dabs of butter Teacher ● Marker ● Masking tape ● Very warm water ● Room temperature water ● Cold water ● Paper plates NOTE: Consider storing the very warm water and cold water in insulated containers prior to giving to students to maximize results.
Quiz 2		
Review / Flex Day		
Unit Test **No PBA**		

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object. (Unit 1, Lessons 1-2)**	
4.0	**Students will be able to:** ● **Explain how the energy of an object is related to the object's speed, and provide real world examples.**
3.0	**Students will be able to:** ● **Explain how the energy of an object is related to the object's speed.**
2.0	**Students will be able to:** ● **Define energy and speed.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. (Unit 1, Lessons 5-10)**	
4.0	**Students will be able to:** ● **Provide evidence that energy can be transferred from place to place by sound, light, and/or heat, and provide real world examples.**
3.0	**Students will be able to:** ● **Provide evidence that energy can be transferred from place to place by sound, light, and/or heat.**
2.0	**Students will be able to:** ● **Identify when energy is being transferred by sound, light, and/or heat.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide. (Unit 1, Lessons 3-4)**	
4.0	**Students will be able to:** ● **Predict what changes in energy will occur when objects collide, and provide real world examples.**
3.0	**Students will be able to:** ● **Predict what changes in energy will occur when objects collide.**
2.0	**Students will be able to:** ● **Describe what happens when objects collide.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit 1 Modifications for Special Population Students	
Advanced Learners	● Use Elaborate sections of the lessons to extend student thinking. Lesson 1.5: Sounds of the Game - Allow students who play instruments to play them alone and as a group. ● Allow students to complete Investigations, Think Like a Scientist, Think Like an Engineer, and Science Careers independently. Lesson 1.2: Speed Lesson 1.4: Motion Lesson 1.6: Sound Lesson 1.8: Light Lesson 1.10: Heat
Struggling Learners	● Utilize online student text book with text-to-speech option ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials
English Language Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 1.1: Batter Up! – *energy* Lesson 1.3: Hit the Ball – *motion, transfer* Lesson 1.5: Sounds of the Game – *vibrations, transform* Lesson 1.9*:* Heat it Up! – *thermal energy*
Special Needs Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 1.1: Batter Up! – *energy* Lesson 1.3: Hit the Ball – *motion, transfer* Lesson 1.5: Sounds of the Game – *vibrations, transform* Lesson 1.9*:* Heat it Up! – *thermal energy* ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials – Assist in identifying relevant facts or provide previously identified facts ● Modify Format of “Wrap it Up!” questions – Provide sentence starters – Provide word banks or key phrases – Allow answers to be given orally

Interdisciplinary Connections

Indicators:
ELA/Literacy-
RI.CR.4.1- Refer to details and examples as textual evidence when explaining what an informational text says explicitly and make relevant connections when drawing inferences from the text.
RI.IT.4.3- Describe the impact of individuals and events throughout the course of a text, explaining events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on evidence in the text.

W.IW.4.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
W.WR.4.5. Conduct short research projects **that use multiple reference sources (print and non-print) and** build knowledge through investigation of different aspects of a topic.
W.SE.4.6. Gather relevant information from **multiple** print and digital sources; take notes, **prioritize** and categorize information and provide a list of sources.

Integration of 21st Century Skills

Indicators:
8.1.5.A.1-Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
8.1.5.A.3-Use a graphic organizer to organize information about a problem or issue.
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.
8.1.5.F.1-Apply digital tools to collect, organize, and analyze data that support a scientific finding.
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.
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.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.

Unit Title: Unit 2: Physical Science-Uses of Energy

Unit Description:

Students will continue to learn about energy. They will learn about electric circuits, renewable and nonrenewable resources.

Unit Duration: 19 Days

Desired Results

New Jersey Student Learning Standard(s):

4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment

3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

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

Indicators:

PS3.A: Definitions of Energy

- The faster a given object is moving, the more energy it possesses. (4-PS3-1)
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2, 4-PS3-3)

PS3.B: Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2, 4-PS3-3)
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2, 4-PS3-4)

PS3.D: Energy in Chemical Processes and Everyday Life

- The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4)

ESS3.A: Natural Resources

- Energy and fuels that humans use are derived from natural sources, and their uses affect the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)

ETS1.A: Defining Engineering Problems

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (*secondary to 4-PS3-4*)

Understandings:
Students will understand…

- The faster a given object is moving, the more energy it possesses.
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents.
- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.
- The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use.
- Energy and fuels that humans use are derived from natural sources, and their uses affect the environment in multiple ways. Some resources are renewable over time, and others are not.
- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

Essential Questions:

- What is electrical energy?
- What is an electric current?
- How does an electric circuit transfer energy?
- How can energy of motion produce electricity?
- What does it mean to “produce energy?”
- What are natural resources?
- What is the difference between renewable and nonrenewable resources?

Assessment Evidence

Performance Tasks:

Investigate Lessons-Students will practice performance tasks in cooperative groups engaging in scientific steps of an investigation.

- Lesson 2.3: Electric Circuits (p. 48-49)
  Predict and observe that only objects made of metals will complete a circuit.

Think Like an Engineer - Students will engage in performance tasks to design, build, and test a prototype device and analyze and improve results. These tasks will be recorded in their science notebook and evaluated by a Teacher Rubric and Student Rubric.

- *Finding Solutions to Energy Problems* (p. 56-61) Identify the problem and constraints an urban planner uses to develop a solution using plant waste to create sustainable energy.
- *Design, Test, and Refine a Device* (p. 62-65) Create a solar cooking device.
- *Design, Test, and Refine a Device* (p. 42-43) Create a buzzer for use in a board game.

Think Like a Scientist - Students will engage in performance tasks to plan and conduct an investigation, provide evidence and use that evidence to explain results.

- *Obtain and Combine Information* (p. 66-67)
  Use graphs to describe how energy affects the environment and predict what might happen in the future.

Other Evidence:

- Science Notebook Entries
- Quizzes
  - After Lesson 4 -- "Spin It!"
  - After Lesson 7 -- "Energy Resources and the Environment"
- Unit Test

Benchmarks: Physical Science Benchmark will be given after Unit 3.

Learning Plan

Resources: National Geographic Learning: Exploring Science Teacher's Guide, Student Text Books, Interactive eBook and Website, Laptops, Student Science Notebooks

Learning Activities:

Lesson and Duration	Activities	Materials/Suggested Resources
2.1: It's Electric (textbook p. 24-25, online text 44-45) **NJSLS: 4-PS3-2, 4- PS3-3, 4-PS3-4** PS3.A: Definitions of Energy PS3.B: Conservation of Energy and Energy Transfer **Objective(s):** ● Define electrical energy and electric current. ● Recognize that electric current transfers energy from place to place. **Duration:** 1 Day	**Engage:** *OPTIONAL: Give one student flashlight with batteries and another flashlight without batteries, discuss why one works while other does not.* Discuss personal interactions with electrical energy **Explore:** Preview & Read text **Explain:** ● Define **electrical energy** & **electric current**. Connect speed to energy ● Recognize that electric current transfers energy **Elaborate:** *Science Notebook* ● Research & list steps to change chemical energy into electrical energy OR create t-chart for electrical energy, thermal energy, and sound energy ● Research & compare finding about rechargeable batteries **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: 2 flashlights (remove batteries from one) Research how chemical energy inside a battery can be transformed into electrical energy Locate information on how rechargeable batteries work How do batteries work? Video
2.2: Electric Circuits (textbook p. 26-27, online text 46-47) **NJSLS: 4-PS3-2, 4- PS3-3, 4-PS3-4** PS3.A: Definitions of Energy PS3.B: Conservation of Energy and Energy Transfer **Objective(s):** ● Define electric current ● Know that the transfer of electric energy as current requires a complete circuit **Duration:** 1 Day	**Engage:** *OPTIONAL: Give each student a small object to pass around in a circle. Discuss how this model transfers electrical energy.* Discuss ways to turn on lights. **Explore:** Preview & Read text **Explain:** ● Define **electrical circuits**. ● Know that current requires a circuit **Elaborate:** *Science Notebook* ● Draw diagram connecting lanterns to power plant **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: class set of small objects such as pennies or erasers OPTIONAL: Digital Wrap-Up in Interactive E-book

2.3: Electric Circuits ***INVESTIGATE** (textbook p. 28-29, online text p. 48-49) **NJSLS: 4-PS3-2** **Objective(s):** ● Make observations to provide evidence that energy can be transferred from place to place by electric currents. ● Implement an experimental investigation to test one variable- the object /material that completes an electrical circuit. **Duration:** 1 Day	**Engage:** *OPTIONAL: Students study and discuss lab materials they can identify.* Study/discuss lab materials that students recognize. Describe ways electrical energy is being used in photograph on p. 28-29 **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations & conclusions **Elaborate:** Present & discuss guiding questions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	Each Group of 4 ● Small flashlight bulb in holder ● D-cell battery in holder ● 3 pieces of electrical wire ● Rubber band ● Metal washer ● Plastic spoon ● Penny ● Large, metal paper clip ● Crayon Teacher ● Wire stripper/cutter
2.4: Spin It! (textbook p. 30-31, online text p. 50-51) **NJSLS: 4-PS3-2, 4- PS3-4** PS3.A: Definitions of Energy PS3.B: Conservation of Energy and Energy Transfer **Objective(s):** ● Recall that electric current can transfer energy from place to place and then be used locally to produce motion, sound, heat or light. ● Explain that current is produced by transforming the energy of motion into electrical energy. **Duration:** 1 Day	**Engage:** *OPTIONAL: Students explore how to make a pinwheel move and discuss transfer of energy.* Recall that moving objects have energy and speed affects energy **Explore:** Preview & Read text **Explain:** ● Define **energy of motion** ● Explain how current is produced **Elaborate:** *Science Notebook* ● Write step-by-step account of how wind becomes energy ● Research bicycle generators ● Brainstorm ways energy of motion could be utilized **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: 1 pinwheel for every 2-3 students Bicycle generator website OPTIONAL: Digital Wrap-Up in Interactive E-book
2.5: Finding Solutions to Energy Problems ***THINK LIKE AN ENGINEER** **Case Study** (textbook p. 32-37, online text 56-61) **NJSLS: 4-PS3-4** ETS1.A: Defining Engineering Problems **Objective(s)**: ● Identify an engineering problem, its constraints, and criteria for a solution. **Duration**: 2 Days	**Engage:** *OPTIONAL: Display and discuss leftovers from preparing meal (it's all waste, can trash it or compost it, what if a machine could turn this into electricity.* Discuss ways life would be different without electricity. **Explore:** Preview & Read text **Explain:** ● Identify the problem ● Define *sustainable* ● Identify constraints of the problem ● Specify criteria for successful solution ● Remember that energy can be transferred ● Identify the solution **Elaborate:** *Science Notebook* ● Research & take notes about Tanzania ● Extend thinking about biodigesters as an energy solution ● Research solar energy ● Prepare presentation of findings with visuals **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Gather variety of food items left over from meal such as coffee grounds, egg shells, bread crust, banana peel. Research Tanzania RE: biodigesters (students can explore on own or you can provide sites) Connect to Jane Goodall's Gombe Chimpanzee Reserve
Quiz 1		

2.6: Design, Test, and Refine a Device ***THINK LIKE AN ENGINEER** (textbook p. 38-41, online text 62-65) **NJSLS**: **4-PS3-4, 3-5- ETS1-1, 3-5-ETS1-3** **Objective(s)**: ● Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. ● Define a design problem that includes specified criteria for success and constraints. ● Plan and carry out a fair test to identify aspects of a prototype that can be improved. **Duration**: 3 Days	**Engage:** *OPTIONAL: View and discuss video of egg cooking on street* *Science Notebook* ● Read introduction in text ● Identify problem, criteria, and constraints **Explore:** *Science Notebook* ● Design & build solar oven prototype ● Test solar oven & record observations **Explain:** *Science Notebook* ● Refine or change solution ● Compare data ● Analyze & explain results **Elaborate:** *Science Notebook* ● Share prototypes & conclusions ● Revise & test design **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Frying egg on street video For groups of 4: ● 2 thermometers ● Stopwatch ● Variety of Supplies ○ Cardboard boxes ○ Clear tape ○ Aluminum foil ○ Plastic wrap ○ Foam core ○ Bubble wrap ○ Rubber bands ○ Chenille stems ○ Black construction paper Teacher ● Pictures of simple solar ovens Photo 1 Photo 2 Photo 3 ● Extra boxes ● Extra supplies
2.7: Design, Test, and Refine a Device ***THINK LIKE AN ENGINEER** (textbook p. 42-43, online text p. 66-67) **NJSLS**: **4-PS3-4, 3-5-ETS1-1, 3-5- ETS1-3** **Objective**: ● Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. ● Define a design problem that includes specified criteria for success and constraints. ● Plan and carry out a fair test to identify aspects of a prototype that can be improved. **Duration**: 2 Days	**Engage:** *OPTIONAL: Display and discuss several objects with components that flash or make sound (toys, games, sneaker with light up sole). Discuss the purpose of objects and energy observed.* *Science Notebook* ● Read introduction in text ● Identify problem, criteria, and constraints **Explore:** *Science Notebook* ● Design & build buzzer prototype ● Test buzzer & record observations **Explain:** *Science Notebook* ● Refine or change solution ● Test & record observations ● Analyze & explain results **Elaborate:** *Science Notebook* ● Share prototypes & conclusions ● Revise & test design **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: several objects with components that flash or make sound (toys, games, sneaker with light up sole). Research Solar Energy – how simple solar devices are helping people in poor and remote areas (students can explore on own or you can provide sites)

2.8: Nonrenewable Energy Resources (textbook p. 44-45, online text p. 68-69) **NJSLS**: **4-ESS3-1, 4- PS3-4** ESS3.A: Natural Resources PS3.D: Energy in Chemical Processes and Everyday Life **Objective**: ● Explain what the expression "produced energy" refers to. ● List Energy Resources derived from natural resources that are not renewable over time. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photo of someone pumping gasoline.* Discuss what fossils have to do with energy. **Explore:** Preview & Read text **Explain:** ● Describe how energy is "produced" ● Define **fossil fuel** & **nonrenewable energy resource** **Elaborate:** *Science Notebook* ● Research & take notes about the formation and extraction of coal, natural gas, and oil (petroleum) **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Gas station photo Research more about coal, natural gas, and oil (petroleum) regarding how it was formed and extracted (students can explore on own or you can provide sites)
2.9: Renewable Energy Resources (textbook p. 46-47, online text p. 70-71) **NJSLS: 4-ESS3-1** ESS3.A: Natural Resources **Objective**: ● List Energy Resources derived from natural sources that are renewable over time. ● **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photo of solar car. Not solar panels. Does this car use gasoline like car from prior lesson?* Refer to photo of wind turbine in today's lesson. Discuss the type of energy wind has. **Explore**: Preview & Read text **Explain:** ● Define **renewable energy resources** ● Identify renewable energy resources **Elaborate:** *Science Notebook* ● Research & make a table about how other countries use renewable energy resources **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Solar car photo Research how to find out how other countries use renewable energy resources regarding which use the most and how do they use it (students can explore on own or you can provide sites) OPTIONAL: Mystery Science Task
2.10: Energy Resources and the Environment (textbook p. 48-49, online text 72-73) **NJSLS**: **4-ESS3-1, 4- PS3-4** ESS3.A: Natural Resources, PS3.D: Energy in Chemical Processing and Everyday Life **Objective**: ● Recall that the energy we use for electricity and transportation has to come from another source. ● Compare the effects different energy resources have on the environment. **Duration**: 1 Day	**Engage:***OPTIONAL: View and discuss photo "Effects of Oil Spills" in Life Science Gallery in online text* *OPTIONAL: Complete Inside-Outside Circle task in online text.* Discuss local types of energy resources**.** **Explore:** Preview & Read text **Explain:** ● Describe the need for energy ● Evaluate advantages and disadvantages of energy resources ● *OPTIONAL: Refer back to photo to discuss what to consider when using technology to harvest natural resources* ● *OPTIONAL: View video "Energy Resources" and connect to lesson* **Elaborate:** *Science Notebook* ● Research tidal energy, geothermal energy, or biofuel ● Record advantages and disadvantages **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Photo titled "Effects of Oil Spills" in Life Science Gallery of online text (view in Full Screen to conceal caption) Research tidal energy, geothermal energy, or biofuel regarding advantages and disadvantages (students can explore on own or you can provide sites) OPTIONAL: Video "Energy Resources" found in resources menu in online text OPTIONAL: Digital Wrap-Up in Interactive E-book

Quiz 2		
2.11: Obtain and Combine Information ***THINK LIKE A SCIENTIST** (textbook p. 50-51, online text p. 74-75) **NJSLS**: **4-ESS3-1 Objective**: ● Obtain and combine information to describe that energy is derived from natural resources and their uses affect the environment. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photo of solar powered cell phone charger.* Review fossil fuels. **Explore:** Preview & Read text **Explain:** *Science Notebook* ● Describe energy resources ● Describe how energy use affects the environment **Elaborate:** *Science Notebook* ● Research & take notes on environmental problems with fossil fuels **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Solar powered cell phone charger photo Research to learn more details about the environmental problems associated with fossil fuels (students can explore on own or you can provide sites)
Review/Flex Day		
Unit 2 Test **80 pts. Question/Answer** **20 pts. PBA - "Think Like an Engineer" Lesson 2.7 (Rubric TR p. 11)**		

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. (Unit 2, Lessons 1-4)**	
4.0	**Students will be able to:** ● **Provide evidence that energy can be transferred from place to place by electric currents, and provide real world examples.**
3.0	**Students will be able to:** ● **Provide evidence that energy can be transferred from place to place by electric currents.**
2.0	**Students will be able to:** ● **Identify when energy is being transferred by electric currents.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **4-PS4-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.** **3-5-ETS1-1** **Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or cost.** **3-5-ETS1-3** **Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. (Unit 2, Lessons 5-7, 11)**	
4.0	**Students will be able to:** ● **Independently design a device that converts energy from one form to another reflecting a need or want that includes specified criteria, plan and carry out fair tests to control variables and consider failure points, and identify aspects of a model or prototype that can be improved.**
3.0	**Students will be able to:** ● **Design a device that converts energy from one form to another reflecting a need or want that includes specified criteria, plan and carry out fair tests to control variables and consider failure points, and identify aspects of a model or prototype that can be improved.**
2.0	**Students will be able to:** ● **Design and test a device that converts energy from one form to another.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):	
4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. (Unit 2, Lessons 8-10)	
4.0	**Students will be able to:** ● **Describe that energy and fuels are derived from natural resources and their uses affect the environment, and provide real world examples.**
3.0	**Students will be able to:** ● **Describe that energy and fuels are derived from natural resources and their uses affect the environment.**
2.0	**Students will be able to:** ● **Define and identify natural resources.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit 2 Modifications for Special Population Students	
Advanced Learners	● Use Elaborate sections of the lessons to extend student thinking. Lesson 8: Nonrenewable Energy Resources - Students develop presentations about fossil fuels that include diagrams from the internet and compare their findings to find similarities and differences. Lesson 10: Energy Resources and the Environment - Students work in a small group to discuss renewable resources, determine which would work best in their area, and create a presentation to support their choice. ● Allow students to complete investigations, Think Like a Scientist, Think Like an Engineer, and Science Careers independently. Lesson 2.3: Electric Circuits Lesson 2.5: Finding Solutions to Energy Problems Lesson 2.6: Design, Test, and Refine a Device Lesson 2.7: Design, Test, and Refine a Device Lesson 2.11: Obtain and Combine Information
Struggling Learners	● Utilize online student text book with text-to-speech option ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials
English Language Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 2.1: It's Electric – *electrical energy, electrical current* Lesson 2.2: Electric Circuits – *electrical circuit* Lesson 2.4: Spin It! – *energy of motion* Lesson 2.8: Nonrenewable Energy Resources – *fossil fuel, nonrenewable energy resources* Lesson 2.9: Renewable Energy Resources – *renewable energy resources, solar energy, wind energy*

Special Needs Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 2.1: It's Electric – *electrical energy, electrical current* Lesson 2.2: Electric Circuits – *electrical circuit* Lesson 2.4: Spin It! – *energy of motion* Lesson 2.8: Nonrenewable Energy Resources – *fossil fuel, nonrenewable energy resources* Lesson 2.9: Renewable Energy Resources – *renewable energy resources, solar energy, wind energy*

	● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) □ Use leveled research materials □ Assist in identifying relevant facts or provide previously identified facts ● Modify Format of "Wrap it Up!" questions □ Provide sentence starters □ Provide word banks or key phrases □ Allow answers to be given orally

Interdisciplinary Connections

Indicators:
ELA/Literacy-
W.WR.4.5. Conduct short research projects **that use multiple reference sources (print and non-print) and** build knowledge through investigation of different aspects of a topic.
W.SE.4.6. Gather relevant information from **multiple** print and digital sources; take notes, **prioritize** and categorize information and provide a list of sources.

Mathematics-
MP.2-Reason abstractly and quantitatively. *(4-ESS3-1)*
MP.4-Model with mathematics. *(4-ESS3-1)*
4.OA.A.1-Interpret a multiplication equation as a comparison, e.g., interpret 35=5x7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. *(4-ESS3-1)*
4.OA.A.3-Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Access the reasonableness of answers using mental computation and estimation strategies including rounding. *(4-PS3-4)*

Integration of 21st Century Skills

Indicators:

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

8.1.5.A.3-Use a graphic organizer to organize information about a problem or issue.

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.

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

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.

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 uses of resources.

8.2.5.B.4-Research technologies that have changed due to society's changing needs and wants.

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.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.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.

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 Title: Unit 3: Physical Science-Waves

Unit Description:

The students will be introduced to waves. They will learn about wave properties and information technology.

Unit Duration: 13 Days

Desired Results

New Jersey Student Learning Standard(s):

4-PS4-1: Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

4-PS4-3: Generate and compare multiple solutions that use patterns to transfer information.

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

Indicators:

PS4.A: Wave Properties

- Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; it does not move in the direction of the wave except when the water meets the beach. (*Note: This grade band endpoint was moved from K-2.*) (4-PS4-1)

PS4.C: Information Technologies and Instrumentation

- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information--convert it from digitized form to voice--and vice versa. (4-PS4-3)

ETS1.C: Optimizing the design solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (*secondary to 4-PS4-3*)

Understandings:
Students will understand…

- Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; it does not move in the direction of the wave except when the water meets the beach.
- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information--convert it from digitized form to voice--and vice versa.
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Essential Questions:

- How do waves travel?
- What is amplitude?
- What is wavelength?
- How is the motion of waves transferred into energy?
- How is information transmitted over long distances?
- How is digitized information used?

Assessment Evidence

Performance Tasks:
Investigate Lessons-Students will practice performance tasks in cooperative groups engaging in scientific steps of an investigation.

- Lesson 3.3: *Wavelength and Amplitude* (textbook p. 56-57, online text p. 84-85) Create wave models and describe the properties of each wave.
- Lesson 3.4: *How Waves Move Objects* (textbook p. 58-59, online text p. 82-83)
  Create waves and observe the wave and motion of the objects in the water.
- Lesson 3.7: *Use a Code* (textbook p. 64-65, online text p. 90-91)
  Create and transmit a message using Morse code.

Think Like an Engineer-Students will engage in performance tasks to design, build, and test a prototype device and analyze and improve results. These tasks will be recorded in their science notebook and evaluated by a Teacher Rubric and Student Rubric.

- *Compare Multiple Solutions (textbook* p. 66-67, online text p. 92-93) Create a way to transmit Morse code.

Science Career-Students will engage in performance tasks to learn about careers in science, the work scientists do, and how it connects to the current learning.

- *Animal Tracker* (textbook p. 68-69, online text p. 100-101)
  Learn about behavioral ecologists and how they use technology to track animal movement.

Other Evidence:

- Science Notebook Entries
- Quizzes
  - After Lesson 7 -- “Use a Code”
- Unit Test
- Physical Science Benchmark

Benchmarks: Physical Science Benchmark will be given at the end of this unit.

Learning Plan

Resources: National Geographic Learning: Exploring Science Teacher’s Guide, Student Textbooks, Interactive eBook and Website, Laptops, Student Science Notebooks

Learning Activities:

Lesson and Duration	Activities	Materials/Suggested Resources
3.1: Waves (textbook p. 52-53, online text p. 76-77) **NJSLS: 4-PS4-1** PS3.A: Wave Properties **Objective(s):** ● Describe waves as a regular pattern of motion produced by a disturbance. ● Explain the motion of water waves. **Duration:** 1 Day	**Engage:** *OPTIONAL: Do the wave as a class to tap prior knowledge.* Discuss evidence of waves at the beach transferring energy. **Explore:** Preview & Read text **Explain:** ● Describe waves ● Explain wave motion ● **Elaborate:** *Science Notebook* ● Research videos of waves ● Describe wave motion **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions and 4 square diagram	Research to find videos of water waves, ocean waves, or surfers regarding describing the motion (students can explore on own or you can provide sites)
3.2: Properties of Water Waves (textbook p.54-55, online text p. 78-79) **& Properties of Sound Waves** (textbook p. 54-55, online text p. 80-81) *this lesson was previously 3.2 Wave Properties, teach this in ONE day **NJSLS: 4-PS4-1** **PS3.A: Wave Properties** **Objective(s):** ● Describe the wave properties of amplitude and wavelength. **Duration:** 1 Day	**PROPERTIES OF WATER WAVES** **Engage:** *OPTIONAL: Give students small objects to drop into bin of water and observe waves made. Discuss what is observed.* Discuss the causes of water waves **Explore:** Preview & read text **Explain:** Define **amplitude** and **wavelength** ● Describe wave properties (amplitude and wave length) **Elaborate:** *Science Notebook* ● Research the definition of frequency and discuss how frequency is related to wavelength OR view video of people wading in ocean to discuss amplitude and wavelength of waves. **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram --- **PROPERTIES OF SOUND WAVES** **Engage:** *OPTIONAL: Whisper a sentence from front of room. Discuss who could hear it, why, and how vocal cords vibrate to create sound.* Discuss examples of sounds and what mediums sound can travel through. **Explore:** Preview & read text **Explain:** ● Describe wave properties ● Define **pitch** and **volume** ● *OPTIONAL: Complete Science in a Snap task in text, noting patterns made.* **Elaborate:** *Science Notebook* ● Discuss differences in amplitude and volume when whispering vs shouting **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: bin half-filled with water, variety of small sinkable objects (one per student) Use glossaries, dictionaries, textbooks, or websites regarding defining frequency and relating it to wavelength OR People wading in ocean (0:35-2:00) OPTIONAL: Digital Wrap-Up in Interactive E-book --- OPTIONAL: elastic coil (slinky), string

3.3: Wavelength and Amplitude ***INVESTIGATE** (textbook p. 56-57, online text p. 84-85) *Lessons 3.3 & 3.4 are reversed in online text, not being adjusted to maintain consistency of notebook materials, page numbers provided are correct **NJSLS: 4-PS4-1** **Objective(s):** ● Develop a model of waves to describe patterns in terms of amplitude and wavelength. **Duration:** 1 Day	**Engage:** Review amplitude and wavelength (can reference the photo of duck provided in lesson). **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text ● *OPTIONAL: Complete Virtual Lab task, Wavelength and Amplitude in online text. Discuss results* **Explain:** Share observations & conclusions **Elaborate:** Present & discuss guiding questions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions.	Each group of 2: ● Chenille stem ● Marker OPTIONAL: Virtual lab task provided in online text called Wavelength and Amplitude
3.4: How Waves Move Objects ***INVESTIGATE** (textbook p. 58-59, online text p. 82-83) *Lessons 3.3 & 3.4 are reversed in online text, not being adjusted to maintain consistency of notebook materials, page numbers provided are correct **NJSLS: 4-PS4-1** **Objective(s):** ● Develop a model of waves to describe amplitude and wavelength. ● Use the model to describe how waves cause objects to move. **Duration:** 1 Day	**Engage:** *OPTIONAL: view video of ship in stormy seas, discuss.* Share experiences being moved by waves and recall properties of waves. **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations & conclusions **Elaborate:** Design investigation to see if objects under water are affected by waves **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Ships in rough seas video (stop at 3:20 mark to avoid news of drowned teen) Each group of 4: ● Rectangular pan or storage container ● Pitcher filled half way with water ● 4x6 index card ● Assortment of floatable objects Teacher ● Paper towels
3.5: Information Technology – GPS (textbook p. 60-61, online text p. 86-87) **NJSLS**: **4-PS4-3** PS4.C: Information Technologies and Instrumentation **Objective(s)**: ● Identify digitized information. ● Describe how information can be transmitted over long distances. **Duration**: 1 Day	**Engage:** Display and discuss mapping software, can reference a photo of a space satellite. Display Google Earth to view your school and discuss students' prior experiences with this. Utilize street view. **Explore:** Preview & Read text **Explain:** ● Identify digitized information ● Describe how GPS works **Elaborate:** *Science Notebook* ● Explore and take notes about location on *EarthExplorer* ● Explore and take notes about *Google Earth* **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions and 4 square diagram	Photo of space satellite Link to Google Earth to enter your school address USGS website

3.6: Information Technology – Cell Phones (textbook p. 62-63, online text p. 88-89) **NJSLS**: **4-PS4-3** PS4.C: Information Technologies and Instrumentation **Objective(s)**: ● Explain how cell phones use digitized information ● Describe the advantages of digitized information **Duration**: 1 Day	**Engage:** *OPTIONAL: display cell phone. Discuss how they make communication across long distances easier. Are there any places they don't work?* Recall information about GPS. **Explore:** Preview & Read text **Explain:** ● Explain how cell phones work ● Describe advantages of digitized information ● *OPTIONAL: View and discuss video, "Energy", from Resources menu online* **Elaborate:** *Science Notebook* ● Research and take notes about bit, byte, megabyte (MB), and gigabyte (GB) **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Photo of cell phone OPTIONAL: "Energy" video found in Resources menu in online text Link to "Energy" video Research terms: bit, byte, megabyte (MB), and gigabyte (GB) (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book
3.7: Use a Code ***INVESTIGATE** (textbook p. 64-65, online text p. 90-91) **NJSLS**: **4-PS4-3** **Objective**: ● Use a pattern to transfer information. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss Morse Code video in online text (view in full screen to conceal caption).* Share experiences with using codes **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations & conclusions **Elaborate:** Present & discuss guiding questions **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions	OPTIONAL: Morse code video in online text (click full screen) Link to Morse Code video Each group of 2: ● Flashlight Teacher N/A OPTIONAL: Mystery Science Task (each set of partners needs access to a flashlight and basic musical instruments)
Quiz 1		
3.8: Compare Multiple Solutions ***THINK LIKE AN ENGINEER** (textbook p. 66-67, online text p. 92-93) **NJSLS**: **4-PS4-3, 3-5- ETS1-3** ETS1.C: Optimizing the Design Solution **Objective**: ● Generate and compare multiple solutions that use patterns to transfer information. ● Determine which of the solutions best solves the problem, given the criteria and constraints. **Duration**: 2 Days	**Engage:** *OPTIONAL: Divide class into small groups, give a member of each group a science term written on a slip of paper to play charades in small group.Identify constraint and criterion for success.* *OPTIONAL: Discuss a time you had difficulty communicating with someone. Discuss barrier and how you attempted to overcome the barrier.* *Science Notebook* ● Read introduction in text ● Identify problem, criteria, and constraints **Explore:** *Science Notebook* ● Design & build communication device prototype ● Test communication device & record observations **Explain:** *Science Notebook* ● Refine or change solution ● Analyze & explain results **Elaborate:** *Science Notebook* ● Invent code **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: several small slips of paper with one science term written on each slip (1-2 slips of paper per group) Each group of 4: ● **Things found in a cabin EX:** ○ shoes ○ guide book ○ flyswatter ○ plastic combs ○ box of tissues ○ tin cup/bowl ○ spoons ○ soap in a soapbox ○ flying disc ○ playing cards ○ empty water bottles Teacher Samples of codes

3.9: Animal Tracker ***SCIENCE CAREER** (textbook p. 68-69, online text p. 100-101) **NJSLS**: Scientific Knowledge is Based on Empirical Evidence **Objective**: ● Connect the concept of information technology with the career of a behavioral ecologist. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photos involving wildlife radio telemetry. Tap students' prior knowledge of using information technology to observe animal behavior.* Share use of technology to observe animals **Explore**: Preview & Read text **Explain:** ● Describe the work of a behavioral ecologist ● Connect information technology to the career of an ecologist ● *OPTIONAL: view and discuss video, "Chasing Butterflies for Science", to explore how technology is used for tracking* **Elaborate:** *Science Notebook* ● Research Crittercam and record questions ● Research Tracking Animal Migrations and record questions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Photo 1- wolf Photo 2- turtle Photo 3- hawk Photo 4- bear Photo 5- scientist OPTIONAL: "Chasing Butterflies for Science" video found in Resources menu in online text Link to "Chasing Butterflies for Science" video Crittercam from National Geographic Tracking Animal Migrations from National Geographic
Review/Flex Day		
Unit 3 Test **20 pts. PBA – "Think Like an Engineer" Lesson 3.8 (Rubric TR p. 16)**		
Benchmark 1 (Physical Science)		

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **4-PS4-1: Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. (Unit 3, Lessons 1-4)**	
4.0	**Students will be able to:** ● **Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move, and provide real world examples.**
3.0	**Students will be able to:** ● **Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.**
2.0	**Students will be able to:** ● **Define wave and wavelength. Develop a model of waves.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **4-PS4-3: Generate and compare multiple solutions that use patterns to transfer information. (Unit 3, Lessons 5- 8)**	
4.0	**Students will be able to:** ● **Generate and compare multiple solutions that use patterns to transfer information, and provide real world examples.**
3.0	**Students will be able to:** ● **Generate and compare multiple solutions that use patterns to transfer information.**
2.0	**Students will be able to:** ● **Identify solutions that use patterns to transfer information.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. (Unit 3, Lesson 8)**	
4.0	**Students will be able to:** ● **Independently 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.**
3.0	**Students will be able to:** ● **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.**
2.0	**Students will be able to:** ● **Plan and carry out fair tests of a model or prototype.**
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 Modifications for Special Population Students	
Advanced Learners	● Use Elaborate sections of the lessons to extend student thinking. Lesson 3.1: Waves - Students choose a video of waves and explain how it demonstrates wave motion. Lesson 3.3: Wavelength and Amplitude - Students investigate longitudinal waves. ● Allow students to complete investigations, Think Like a Scientist, Think Like an Engineer, and Science Careers independently. Lesson 3.3: Wavelength and Amplitude Lesson 3.4: How Waves Move Objects Lesson 3.7: Use a Code Lesson 3.8: Compare Multiple Solutions Lesson 3.9: Animal Tracker
Struggling Learners	● Utilize online student text book with text-to-speech option ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials
English Language Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 3.1: Waves – *wave* Lesson 3.2: Wave Properties – *amplitude, wavelength* Lesson 3.5: Information Technology – GPS – *digitized, Global Positioning System (GPS), transmit*
Special Needs Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 3.1: Waves – *wave* Lesson 3.2: Wave Properties – *amplitude, wavelength* Lesson 3.5: Information Technology – GPS – *digitized, Global Positioning System (GPS), transmit* ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials – Assist in identifying relevant facts or provide previously identified facts
	● Modify Format of “Wrap it Up!” questions – Provide sentence starters – Provide word banks or key phrases – Allow answers to be given orally

Interdisciplinary Connections

Indicators:
ELA/Literacy-
RI.CR.4.1- Refer to details and examples as textual evidence when explaining what an informational text says explicitly and make relevant connections when drawing inferences from the text.
SL.UM.4.5-Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.
Mathematics-
MP4-Model with mathematics. *(4-PS4-1)*
4.G.A.1-Draw points, lines, line segments, rays, angles, (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. *(4-PS4-1)*

Integration of 21st Century Skills

Indicators:
8.1.5.A.1-Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
8.1.5.A.3-Use a graphic organizer to organize information about a problem or issue.
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.
8.1.5.F.1-Apply digital tools to collect, organize, and analyze data that support a scientific finding.
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.
8.2.5.B.4-Research technologies that have changed due to society's changing needs and wants.
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.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.7-Work with peers to redesign an existing product for a different purpose.
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.
9.2.4.A.3-Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.

Unit Title: Unit 4: Life Science-Structure, Function, and Information Processing

Unit Description:

The students will be introduced to structure, function, and information processing of plants and animals. They will learn about the internal and external structures of plants and animals, and how animals process light and sound.

Unit Duration: 16 Days

Desired Results

New Jersey Student Learning Standard(s):

4-PS4-2: Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-LS1-2: Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Indicators:

PS4.B: Electromagnetic Radiation

- An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)

LS1.A: Structure and Function

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

LS1.D: Information Processing

- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)

Understandings:

Students will understand that…

- An object can be seen when light reflected from its surface enters the eyes.
- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions

Essential Questions:

- What roles do the internal and external structures of plants serve in their growth, survival, behavior, and reproduction?
- What roles do the internal and external structures of animals serve in their growth, survival, behavior, and reproduction?
- What roles do animals' senses play in guiding their actions?
- How do eyes process light to see objects?

Assessment Evidence

Performance Tasks:

Investigate Lessons - Students will practice performance tasks in cooperative groups engaging in scientific steps of an investigation.

- Lesson 4.8: *How We See* (textbook p. 90-91, online text p. 130-131)
  Draw a model to show how light reflecting from an object enters your eye allowing you to see the object.

Think Like a Scientist-Students will engage in performance tasks to plan and conduct an investigation, provide evidence and use that evidence to explain results. These tasks will be recorded in their science notebook and evaluated by a Teacher Rubric and Student Rubric.

- *Construct an Argument* (textbook p. 76-77, online text p. 114-115)
  Compare the internal and external structures of a buttercup and a wild rose. Explain how the structures of a buttercup help it to grow, survive, and reproduce.
- *Construct an Argument* (textbook p. 84-85, online text p. 124-125)
  Compare the internal and external structures of a wolf and an elephant. Explain how the structures of a wolf help it to grow, survive, and reproduce.
- *Use a Model* (textbook p. 92-93, online text p. 132-133)
  Design a model to show how a mouse and a snake might receive information through their senses.

Science Career-Students will engage in performance tasks to learn about careers in science, the work scientists do, and how it connects to the current learning.

- *Dog Whisperer* (textbook p. 94-97, online text p. 138-141)
  Learn about dog psychologists and how they show owners how to change the way they treat their dogs to improve their behavior.

Other Evidence:

- Science Notebook Entries
- Quizzes
  - After Lesson 8 -- "How We See"
- Unit Test

Benchmarks: Life and Earth Science Benchmark will be given after Unit 6.

Learning Plan

Resources: National Geographic Learning: Exploring Science Teacher's Guide, Student Text Books, Interactive eBook and Website, Laptops, Student Science Notebooks

Learning Activities:

Lesson and Duration	Activities	Materials/Suggested Resources
4.1: External Structures of a Wild Rose (textbook p. 72-73, online text p. 110-111) **NJSLS: 4-LS1-1** LS1.A: Structure and Function **Objective(s):** ● Identify the external structures of a wild rose. ● Describe the functions served by the external structures of a wild rose. **Duration:** 1 Day	**Engage:** *OPTIONAL: display roses, brainstorm parts we can identify and compare to other flowering plants we are familiar with.* Describe a rose **Explore:** Preview & Read text **Explain:** ● *OPTIONAL: watch time lapse video of rose blooming in lesson in online text* ● Identify external structures of wild rose ● Describe functions of external structures of wild rose **Elaborate:** *Science Notebook* ● Research plant structures used for growth, survival, and reproduction ● Compile information into class table ● Extend thinking about wild rose's external structures **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: 6 cut white roses with leaves attached Plant structure research (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book IMPORTANT NOTE: If you are doing the optional Engage task for Lesson 4.2 tomorrow, you must put the roses in the colored water before leaving today.
4.2: Internal Structures of a Wild Rose (textbook p. 74-75, online text p.112-113) **NJSLS: 4-LS1-1** LS1.A: Structure and Function **Objective(s):** ● Identify the internal structures of a wild rose. ● Describe the functions served by the internal structures of a wild rose. **Duration:** 1 Day	**Engage:** *OPTIONAL: observe and discuss roses in cups of colored water.* Recall information about external structures of wild rose **Explore:** Preview & Read text **Explain:** ● Identify internal structures of wild rose ● Describe functions of internal structures of wild rose ● *OPTIONAL: students study and discuss "Plant Stem" photo in Life Science Gallery.* ● *OPTIONAL: View and discuss the animation, "Structure of a Flower" in the online lesson.* **Elaborate:** *Science Notebook* ● Research images of leaves, stems, and flowers under a microscope ● *OPTIONAL: slice rose stem vertically, observe and discuss findings* **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: roses from yesterday, 4 cups half-filled with water, food color in 4 different colors (one color per cup), 1 rose in each cup Photo "Plant Stem" in Life Science Gallery Animation "Structure of a Flower" in online lesson animation Plant part images under a microscope (students can explore on own or you can provide sites) OPTIONAL: sharp blade to slice rose stem OPTIONAL: Digital Wrap-Up in Interactive E-book

4.3: Construct an Argument ***THINK LIKE A SCIENTIST** (textbook p. 76-77, online text p. 114-115) **NJSLS: 4-LS1-1** **Objective(s):** ● Construct an argument that plants have internal and external structures that function to support survival, growth, and reproduction. **Duration:** 1 Day	**Engage:** *OPTIONAL: Study and compare 3 plant images. Complete Inside-Outside Circle task.* Recall information about internal and external structures of wild roses **Explore:** Preview & Read text **Explain:** Compare structures of rose and buttercup to construct argument. **Elaborate:** ● Make inferences ● Research plant structures **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions.	OPTIONAL: Water lily image Cucumber plant image Flowering tree image Each group of 4: ● Sticky Notes Teacher N/A Plant structure research (students can explore on own or you can provide sites)
4.4: External Structures of an Elephant (textbook p. 78-79, online text p. 116-117) **NJSLS: 4-LS1-1** LS1.A: Structure and Function **Objective(s):** ● Identify the external structures of an elephant. ● Describe the functions performed by the external structures of an elephant. **Duration:** 1 Day	**Engage:** *OPTIONAL: view and discuss video in online lesson.* Describe elephants **Explore:** Preview & Read text **Explain:** ● Identify internal structures of elephant ● Describe functions of internal structures of elephant ● *OPTIONAL: View and discuss photo "Elephant Eye" in Life Science Gallery.* **Elaborate:** *Science Notebook* ● Research connection between humans' and Asian elephants' intelligence and socialism ● Create collage from research ● Notes about function of elephant's trunk **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Video in online lesson of elephant eating (view in full screen to conceal caption) OPTIONAL: Photo, "Elephant Eye" in Life Science gallery (view in full screen to conceal caption) Research human and elephant intelligence and socialism (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book
4.5: Internal Structures (Organs) of an Elephant (textbook p. 80-81, online text p. 118-119) **NJSLS**: **4-LS1-1** LS1.A: Structure and Function **Objective(s)**: ● Identify the internal structures of an elephant. ● Describe the functions served by the internal structures of an elephant. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss chest x-ray.* List human internal organs. **Explore:** Preview & Read text **Explain:** ● Identify internal organs of elephant ● Describe functions of internal organs of elephant **Elaborate:** *Science Notebook* ● Research organs and functions of elephant's respiratory, digestive, and nervous systems ● Notes about differences between elephants' and humans' internal organs **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Chest x-ray (unlabeled) Chest x-ray (labeled) Research organs and functions of elephant body systems (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book OPTIONAL: Mystery Science Activity

4.6: Bones and Muscles of an Elephant (textbook p. 82-83, online text p. 120-121) **NJSLS**: **4-LS1-1** LS1.A: Structure and Function **Objective(s)**: ● Identify the bones and muscles of an elephant. ● Describe the functions served by the bones and muscles of an elephant. **Duration**: 1 Day	**Engage:** *OPTIONAL: view and discuss x-ray of elephant's foot.* Share experiences with bones and muscles **Explore:** Preview & Read text **Explain:** ● Identify bones and muscles of elephant ● Describe function of bones and muscles of elephant **Elaborate:** *Science Notebook* ● Research how skeletal muscles work to move animals' bodies ● Extend thinking about elephant bones and survival **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: X-ray of elephant's foot Research how skeletal muscles move animals' bodies (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book
4.7: Construct an Argument ***THINK LIKE A SCIENTIST** (textbook p. 84-85, online text p. 124-125) **NJSLS**: **4-LS1-1 Objective**: ● Construct an argument that animals have internal and external structures that function to support survival, growth, and behavior. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss wolf pack video.* Recall information about internal and external structures of elephants. **Explore:** Preview & Read text **Explain:** *Science Notebook* ● List internal and external structures of wolf ● Compare structures of wolf and elephant **Elaborate:** ● Construct argument how structures help the wolf survive, grow, behave, or reproduce ● Present rebuttals ● Generalize findings **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Wolf pack video Each group of 4: ● Sticky Notes Teacher ● N/A
4.8: Animal Senses (textbook p. 86-87, online text p. 126-127) **NJSLS**: **4-LS1-2** LS1.D: Information Processing **Objective**: ● Describe how animals use sense receptors, process information, and use perceptions and memories to guide their actions. **Duration**: 1 Day	**Engage:** *OPTIONAL: view and discuss photo of cecropia moth.* Discuss senses used when eating an apple. **Explore:** Preview & Read text **Explain:** ● Describe animal senses ● *OPTIONAL: view and discuss video, "Living Things: Information Processing".* ● *OPTIONAL: complete and discuss virtual lab, "Mealworm Behavior".* ● *OPTIONAL: view and write about photo, "Clouded Leopard".* **Elaborate:** *Science Notebook* ● Research how snakes detect sound, how flies see, and how grasshoppers feel ● Extend thinking about animal senses **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Cecropia moth photo OPTIONAL: Video, "Living Things: Information Processing" in online text prior to lesson OPTIONAL: Virtual lab, "Mealworm Behavior", in online text prior to lesson OPTIONAL: Photo, "Clouded Leopard", in Life Science Gallery in online text Research how snakes hear and see, and grasshoppers feel (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book

4.9: Light and Sight (textbook p. 88-89, online text p. 128-129) **NJSLS**: **4-PS4-2** PS4.B: Electromagnetic Radiation **Objective**: ● Describe how an object can be seen. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photos of animals' eyes.* Recall information about animal senses **Explore**: Preview & Read text **Explain:** ● Describe light and sight **Elaborate:** *Science Notebook* ● Research animals that see well in the dark ● Label diagrams of structures **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Photo 1 Photo 2 Photo 3 Photo 4 Photo 5 Research animals that see in the dark (students can explore on own or you can provide sites)
4.10: How We See ***INVESTIGATE** (textbook p. 90-91, online text p. 130-131) **NJSLS**: **4-PS4-2** **Objective**: ● Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photo of animal at night.* Recall clouded leopard's sight and compare to human's sight **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations and conclusions. **Elaborate:** Present and discuss guiding questions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Animal at night photo Each group of 4: ● Flashlight ● Box of classroom objects EX: ○ Ruler ○ Scissors ○ Glue ○ Pencil ○ Marker ○ Erase Teacher N/A OPTIONAL: Mystery Science Task- requires prep from prior lesson (each pair of students needs scissors and markers)
Quiz 1		
4.11: Use a Model ***THINK LIKE A SCIENTIST** (textbook p. 92-93, online text p. 132-133) **NJSLS**: **4-LS1-2** **Objective**: ● Use a model to describe how animals receive, process, and respond to information. **Duration**: 2 Days	**Engage:** *OPTIONAL: Complete and discuss hands-on catching task.* Summarize information about animal senses **Explore:** Preview & Read text **Explain:** ● Make a model of how mouse receives, processes, and responds to information ● Discuss model ● Research snakes ● Revise model – add snake **Elaborate:** ● Share models in partners ● Research how owls receive, process, and respond to information ● Extend thinking by adding owl to model **Evaluate:** *Science Notebook* - Complete "Wrap it Up!" questions	OPTIONAL: 1 ruler for every 2 students Each student: ● Science Notebook ● Pencil Teacher Snakes website Mice website

4.12: Dog Whisperer ***SCIENCE CAREER** (textbook p. 94-95, online text p. 138-141) **NJSLS**: Scientific Knowledge is Based on Empirical Evidence **Objective**: ● Connect the concepts of animals' structure, function, and information processing with the career of an exceptional dog trainer, or "dog whisperer." **Duration**: 1 Day	**Engage:** *OPTIONAL: view and discuss photos of people working with trained dogs.* Share experiences with dogs and behaviors. **Explore:** Preview & Read text **Explain:** ● Describe work of dog trainer ● Connect Science topics to Career of Dog Whisperer **Elaborate:** ● Research Cesar Milan ● Extend thinking about animal behavior **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Photo 1 Photo 2 Photo 3 Photo 4 Photo 5 Photo 6 Research Cesar Milan (students can explore on own or you can provide sites)
Review/Flex Day		
Unit 4 Test **80 pts. Question/Answer** **20 pts. PBA – "Think Like a Scientist" Lesson 4.11 (Rubric TR p. 23)**		

Standard(s): 4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. (Unit 4, Lessons 9-10)	
4.0	**Students will be able to:** ● **Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen, and provide real world examples.**
3.0	**Students will be able to:** ● **Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.**
2.0	**Students will be able to:** ● **Develop a model to show how light allows objects to be seen.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. (Unit 4, Lessons 1-7)	
4.0	**Students will be able to:** ● **Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction, and provide real world examples.**
3.0	**Students will be able to:** ● **Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.**
2.0	**Students will be able to:** ● **Describe the internal and external structures of plants and animals.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): 4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. (Unit 4, Lessons 8, 11)	
4.0	**Students will be able to:** ● **Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways, and provide real world examples.**
3.0	**Students will be able to:** ● **Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.**
2.0	**Students will be able to:** ● **Use a model to show how animals use their senses.**
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 Modifications for Special Population Students	
Advanced Learners	● Use Elaborate sections of the lessons to extend student thinking. Lesson 4.3: Construct an Argument - Students conduct additional research to observe the broad variety within typical plant structures. Lesson 4.9: Light and Sight - Students present labeled drawings of animals and explain findings to the class. ● Allow students to complete investigations, Think Like a Scientist, Think Like an Engineer, and Science Careers independently. Lesson 4.3: Construct an Argument Lesson 4.7: Construct an Argument Lesson 4.8: How We See Lesson 4.11: Use a Model Lesson 4.12: Dog Whisperer
Struggling Learners	● Utilize online student text book with text-to-speech option ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials
English Language Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 4.2: Internal Structures of a Wild Rose – *pistil, stamens* Lesson 4.9: Light and SIght – *reflects*
Special Needs Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 4.2: Internal Structures of a Wild Rose – *pistil, stamens* Lesson 4.9: Light and SIght – *reflects* ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials – Assist in identifying relevant facts or provide previously identified facts ● Modify Format of “Wrap it Up!” questions – Provide sentence starters – Provide word banks or key phrases – Allow answers to be given orally

Interdisciplinary Connections

Indicators:

ELA/Literacy-

RI.CR.4.1. Refer to details and examples as textual evidence when explaining what an informational text says explicitly and make relevant connections when drawing inferences from the text.

SL.UM.4.5-Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. *(4-PS4-2, 4-LS1-2)*

Mathematics-

MP.4-Model with mathematics. *(4-PS4-2)*

4.G.A.1-Draw points, lines, line segments, rays, angles, (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. *(4-PS4-2)*

4.G.A.3-Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. *(4-LS1-1)*

Integration of 21st Century Skills

Indicators:

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

8.1.5.A.3-Use a graphic organizer to organize information about a problem or issue.

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.

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

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.

8.2.5.B.4-Research technologies that have changed due to society's changing needs and wants.

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.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.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.

9.2.4.A.3-Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.

Unit Title: Unit 5: Earth Science-Earth's Systems: Processes That Shape the Earth

Unit Description:

The students will be introduced to the natural processes that shape the Earth. They will learn about ecosystems and how the Earth is changed by wind, water, ice, living things, and landslides.

Unit Duration: 20 Days

Desired Results

New Jersey Student Learning Standard(s):

4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

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

Indicators:

ESS2.A: Earth Materials and Systems

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)

ESS2.E: Biogeology

- Living things affect the physical characteristics of their regions. (4-ESS2-1)

Understandings:

Students will understand that…

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around
- Living things affect the physical characteristics of their regions

Essential Questions:

- How does the amount of rainfall affect the types of living things found in a region?
- How do water, ice, wind, living organisms, and gravity change and shape the land?
- How do weathering, erosion, and deposition shape and change the land?

Assessment Evidence

Performance Tasks:

Investigate Lessons-Students will practice performance tasks in cooperative groups engaging in scientific steps of an investigation.

- Lesson 10: *Weathering and Erosion* (textbook p. 118-119, online text p. 166-167)
  -Predict and observe two ways weathering and erosion can change sandstone.

Think Like an Engineer-Students will engage in performance tasks to design, build, and test a prototype device and analyze and improve results. These tasks will be recorded in their science notebook and evaluated by a Teacher Rubric and Student Rubric.

- Lesson *Make Observations* (textbook p. 126-129, online text p. 174-177)
  Create a way to prevent soil eroding from farmer's fields.

Other Evidence:

- Science Notebook Entries
- Quizzes
  - After Lesson 5 -- "Eastern Temperate Forest"
  - After Lesson 13-- "Landslides Change Earth's Surface"
- Unit Test

Benchmarks: Life and Earth Science Benchmark will be given after Unit 6.

Learning Plan

Resources: National Geographic Learning: Exploring Science Teacher's Guide, Student Text Books, Interactive eBook and Website, Laptops, Student Science Notebooks

Learning Activities:

Lesson and Duration	Activities	Materials/Suggested Resources
5.1: Rainfall in the United States (textbook p. 100-101, online text p. 148-149) **NJSLS: 4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective(s):** ● Describe how the amount of rainfall varies in different parts of the United States. ● Explain how the amount of rainfall affects the types of living things found in a region. **Duration:** 1 Day	**Engage:** *OPTIONAL: View and discuss before and after images of California wildflower superbloom.* Discuss how heavy rain affects land locally. **Explore:** Preview & Read text **Explain:** ● Contrast average annual precipitation ● Describe how rainfall affects types of living things in a region **Elaborate:** *Science Notebook* ● Research close-up photos of plants from regions ● Label or summarize results **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Superbloom satellite images Research close up photos of plants (students can explore on own or you can provide sites)
5.2: Pacific Northwest Forest (textbook p.102-103, online text p. 150-151) **NJSLS: 4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective(s):** ● Describe how the amount of rainfall affects the types of living things found in the Pacific Northwest forests. ● And identify some of the living things of the Pacific Northwest forests. **Duration:** 1 Day	**Engage:** *OPTIONAL: View and discuss photos from Hoh Rainforest in Washington state.* Use map on pages before lesson to discuss rainfall in Pacific Northwest **Explore:** Preview & Read text **Explain:** ● Identify animals in Northwest Forests ● Generalize about plants of Pacific Northwest ● Draw conclusions about weather **Elaborate:** *Science Notebook* ● Research other plants and animals from Pacific Northwest ● Role-play conversation between organisms **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Photo 1 Photo 2 Photo 3 Photo 4 Photo 5 Research plants and animals from the Pacific Northwest (students can explore on own or you can provide sites)
5.3: Southwest Desert (textbook p. 104-105, online text p. 152-153) **NJSLS: 4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective(s):** ● Identify some of the living things in this Sonoran Desert. ● Describe how the amount of rainfall affects the types of living things found in deserts of the southwestern United States. **Duration:** 1 Day	**Engage:** *OPTIONAL: Study and discuss actual plants or images of cactus and aloe vera.* Recall information about Pacific Northwest Forest **Explore:** Preview & Read test **Explain:** ● Compare rainfall in Southwest desert with Pacific Northwest ● Explain how living things survive in desert ● *OPTIONAL: View and discuss animation, "Adaptations of Plants in Deserts".* **Elaborate:** *Science Notebook* ● Research desert plant or animal ● Label drawing of desert organism **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: A real cactus and aloe vera plant OR Cactus plant photo Aloe vera plant OPTIONAL: Animation, "Adaptations of Plants in Deserts", in online text prior to lesson Research plants and animals from the Southwest Desert (students can explore on own or you can provide sites)

5.4: Central Plains Grassland (textbook p. 106-107, online text p. 154-155) **NJSLS: 4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective(s):** ● Contrast the amount of rain that falls in grasslands with the amounts that fall in deserts and forests. ● Identifies some of the organisms that live in a grassland (prairie). **Duration:** 1 Day	**Engage:** *OPTIONAL: View and compare photos of manicured lawn and grassland ecosystem.* Use map from prior lesson to discuss rainfall in grasslands **Explore:** Preview & Read text **Explain:** ● Describe rainfall in grasslands ● Explain how animals survive in grasslands ● Explain how plants survive in grasslands ● *OPTIONAL: View and discuss photo, "Prairie Plant Roots".* **Elaborate:** *Science Notebook* ● Research plant & animal survival in grasslands ● Make study card(s) **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Manicured lawn photo Grassland photo OPTIONAL: Photo, "Prairie Plants Roots", found in Earth Science gallery Research plants and animals from the Central Plains Grasslands (students can explore on own or you can provide sites)
5.5: Eastern Temperate Forest (textbook p. 108-109, online text p. 156-157) **NJSLS: 4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective(s)**: ● Describe the rainfall in an eastern temperate forest. ● Identify some of the organisms that live in an eastern temperate forest. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photos of deciduous tree through seasons.* Use map from prior lesson to discuss rainfall in eastern temperate forest **Explore:** Preview & Read text **Explain:** ● Describe climate in Eastern temperate forest ● Identify living things in temperate forests ● Explain how living thing sin temperate forests survive ● *OPTIONAL: View and discuss photo, "Fall Colors in Vermont".* **Elaborate:** *Science Notebook* ● Research how climate affects a variety of organisms in the Eastern temperate forest **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Deciduous Tree Photos OPTIONAL: Photo, "Fall Colors in Vermont", found in Earth Science gallery Research how climate affects organisms in the Eastern Temperate Forest (students can explore on own or you can provide sites) OPTIONAL: Mystery Science Task (each small group needs a chenille stem, a coffee stirrer, a heavy book, and 20 paperclips)
Quiz 1		
5.6: Weathering (textbook p. 110-111, online text p. 158-159) **NJSLS**: **4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective(s)**: ● Define weathering and identify agents of weathering. ● Explain how water and wind can break rocks into smaller particles. **Duration**: 1 Day	**Engage:** *OPTIONAL: Complete and discuss hands-on task with rocks.* Discuss what wind with dirt and sand feels like **Explore:** Preview & Read text **Explain:** ● Define & describe **weathering & sediment** ● Explain how rocks weather **Elaborate:** *Science Notebook* ● Research how water and wind weather rocks in arid areas ● Draw and label process of weathering to form rock arch ○ Make collage of weathered rocks **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Variety of 4-6 rocks for each small group Research how water and wind weather rocks in arid areas (students can explore on own or you can provide sites)

5.7: Erosion and Deposition (textbook p. 112-113, online text p. 160-161) **NJSLS: 4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective**: ● Recognize how erosion and depositions of sediment can shape and change the land. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photos of beachfront homes.* Discuss how earth-moving machines change the land **Explore:** Preview & Read text **Explain:** ● Define & describe **sediment & deposition** ● Recognize how erosion and deposition shape and change land **Elaborate:** *Science Notebook* ● Research how erosion and deposition change local land ● Table summarizing findings ● Design travel brochure for landmark **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Photo 1 Photo 2 Photo 3 OPTIONAL: Photo, "Mississippi Delta" in Earth Science gallery OPTIONAL: Video, "Weathering and Erosion" in online text prior to lesson Research how erosion and deposition change local land (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book
5.8: Wind Changes the Land (textbook p. 114-115, online text p. 162-163) **NJSLS**: **4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective**: ● Explain how wind can weather rocks to form sediment, as well as erode and deposit sentiment. ● Describe how sand dunes form. **Duration**: 1 Day	**Engage:** *OPTIONAL: Complete and discuss hands-on sand task.* Discuss sand dunes **Explore:** Preview & Read text **Explain:** ● Explain how wind breaks rocks into smaller pieces ● Explain how wind moves sediment around ● Describe how sand dunes form **Elaborate:** *Science Notebook* ● Research linear, crescent, star, dome and parabolic dunes ● Make table with drawings to summarize findings **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: EACH STUDENT ● newspaper/bulletin board paper to cover desk ● safety goggles ● paper plate ● straw ● sand ● 2-3 small rocks Research types of dunes (students can explore on own or you can provide sites)
5.9: Water Changes the Land (textbook p. 116-117, online text p. 164-165) **NJSLS**: **4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective**: ● Recognize how landforms such as canyons form as the result of erosion by water. **Duration**: 1 Day	**Engage:** *OPTIONAL: complete and discuss hands-on task (do OUTDOORS OR teacher models this for the class indoors)*. Discuss what running water during a heavy rain looks like **Explore**: Preview & Read text **Explain:** ● Explain how moving water changes land ● Explain how canyons form **Elaborate:** *Science Notebook* ● Research history, organisms, geology, etc. of Zion National Park ● Combine finding to create class presentation **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: For every pair or small group- ● 1 deep tray filled with 3 to 4 inches of sand ● turkey baster ● container with 3 to 4 cups of water Research Zion National Park (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book

5.10: Weathering and Erosion *INVESTIGATE (textbook p. 118-119, online text p. 166-167) **NJSLS: 4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective**: ● Model the processes of weathering and the version. ● Describe how weathering and erosion can change the land. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss video of rock tumbler.* Identify and describe examples of weathering **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations & conclusions **Elaborate:** Present & discuss guiding question **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Rock tumbler video Each group of 4: ● 5 pieces of sandstone ● Paper towel ● Pitcher of water ● 16 oz. jar with lid ● Hand lens ● Stopwatch OPTIONAL: Mystery Science Task (each set of partners needs a paper plate, markers, a plastic container with lid, and 5 sugar cubes)
5.11: Ice Changes the Land (textbook p. 120-121, online text p. 168-169) **NJSLS**: **4-ESS2-1** ESS2.A: Earth Materials and Systems **Objective**: ● Recognize that some landforms and land features are the result of changes made by ice. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss aerial photo of Lyell Glacier.* Discuss what happens to a container of liquid left in the freezer **Explore:** Preview & Read text ● Define **glaciers** ● Explain how ice changes Earth's surface ● *OPTIONAL: View and discuss photo, "Freezing and Thawing".* **Elaborate:** *Science Notebook* ● Research how landforms (kames, drumlins, eskers, moraines, kettle lakes, striations, horns, aretes, and cirques) are formed by ice ● Make chart to record findings **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Lyell Glacier photo OPTIONAL: Photo, "Freezing and Thawing", in Earth Science gallery Research how landforms are formed by ice (students can explore on own or you can provide sites)
5.12: Living Things Change the Land (textbook p. 122-123, online text p. 170-171) **NJSLS**: **4-ESS2-1** ESS2.A: Earth Materials and Systems ESS2.E: Biogeology **Objective**: ● Explain how living things can break rocks and soil into smaller particles and move them around to change the land on which they live. **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss termite mound photo.* Share observations of animals changing the land. **Explore:** Preview & Read text **Explain:** ● Explain how organisms affect land ● *OPTIONAL: View and discuss photo, "Beaver Dam".* **Elaborate:** *Science Notebook* ● Research how organisms change land ● Share personal experiences with organisms changing land **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Termite mound photo OPTIONAL: Photo, "Beaver Dam", in Earth Science gallery Research how organisms change land (students can explore on own or you can provide sites)

<table>
<tr>
<td>5.13: Landslides Change Earth's Surface
(textbook p. 124-125, online text p. 172-173)

NJSLS: 4-ESS2-1 ESS2.A: Earth's Materials and Systems

Objective:
● Explain the role of gravity in moving soil and rocks around.
● Define landslide, and explain what causes these movements of rocks and soil.

Duration: 1 Day</td>
<td>Engage: OPTIONAL: Complete and discuss teacher-led demo. Discuss how steepness of a slide affects speed
Explore: Preview & Read text
Explain:
● Define gravity
● Describe landslides & explain what causes them
Elaborate: <u>Science</u> <u>Notebook</u>
● Research images of gravity moving rocks and soil
● Discuss ways mass movements can be prevented or reduced
● OPTIONAL: View and discuss photo, "California Landslide".
Evaluate: <u>Science</u> <u>Notebook</u>
Complete "Wrap it Up!" questions and 4 square diagram</td>
<td>OPTIONAL:
<u>Teacher</u>
● 1 wooden board
● pan or tray (few inches deep)
● several small rocks
● container of water (2-3 cups)

OPTIONAL: Photo, "California Landslide", in Earth Science gallery

Research images of gravity moving rocks and soil (students can explore on own or you can provide sites)</td>
</tr>
<tr>
<td colspan="3">Quiz 2</td>
</tr>
<tr>
<td>5.14: Make Observations
*THINK LIKE AN ENGINEER
(textbook p. 126-129, online text p.174-177)

NJSLS: 4-ESS2-1, 3-5- ETS1-3

Objective:
● Work with a group to design and test a method to reduce the rate of erosion on a hillside.
● Use evidence from their test to defend the effectiveness of their method for slowing the rate of erosion.

Duration: 3 Days</td>
<td>Engage: View and discuss photo in lesson. <u>Science Notebook</u>
● Describe examples of weathering
● Read introduction in text
● Define problem
Explore
● Design & build erosion reducer prototype
● Test erosion reducer & record observations
Explain: <u>Science Notebook</u>
● Refine or change solution
● Test & record observations
● Analyze & present results
Elaborate: <u>Science</u> <u>Notebook</u>
● Revise designs
Evaluate: <u>Science</u> <u>Notebook</u> - Complete "Wrap it Up!" questions</td>
<td><u>Each group of 4</u>:
● Soil, potting soil, or sand
● 3 sturdy plastic or aluminum pans (deep enough to hold soil)
● Watering cans with sprinkler heads
● Pans for collecting water
● Plastic measuring cups or graduated cylinders
● Water
● Rulers
● Bricks or blocks of wood
● Stopwatches
● Mulch, shredded newspaper, grass clippings, small stones, craft sticks
● Aluminum foil
● Poster board
● Markers

<u>Teacher</u>
N/A</td>
</tr>
<tr>
<td colspan="3">Review / Flex Day</td>
</tr>
<tr>
<td colspan="3">Unit 5 Test
20 pts. PBA – "Think Like an Engineer" 5.14 (Rubric TR p. 27)</td>
</tr>
</table>

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. (Unit 5, Lessons 1-13)**	
4.0	**Students will be able to:** ● **Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation, and provide real world examples.**
3.0	**Students will be able to:** ● **Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.**
2.0	**Students will be able to:** ● **Identify different causes of weathering and erosion. Identify where weathering and erosion have occurred.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. (Unit 5, Lesson 14)**	
4.0	**Students will be able to:** ● **Independently 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.**
3.0	**Students will be able to:** ● **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.**
2.0	**Students will be able to:** ● **Plan and carry out fair tests of a model or prototype.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit 5 Modifications for Special Population Students	
Advanced Learners	● Use Elaborate sections of the lessons to extend student thinking. Lesson 5.2 Pacific Northwest - Pairs of students role-play a conversation between a plant and animal found in the Pacific Northwest. Lesson 5.5: Eastern Temperate Forest - Students present their research to describe how the characteristics of a specific type of organism allow it to survive in the temperate forest. Lesson 5.7: Erosion and Deposition - Students choose a favorite landform feature in their area and create a travel brochure. Lesson 5.10: Weathering and Erosion - Students complete experiment with additional rocks of different hardness and present their results. Lesson 5.13: Landslides Change Earth's Surface - Students work in a small group to discuss how some types of mass movements can be prevented or reduced. ● Allow students to complete investigations, Think Like a Scientist, Think Like an Engineer, and Science Careers independently. Lesson 5.4: How Waves Move Objects Lesson 5.7: Use a Code Lesson 5.10: Weathering and Erosion Lesson 5.14: Make Observations
Struggling Learners	● Utilize online student text book with text-to-speech option ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials
English Language Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: ○ Provide visual, verbal, and written examples together ○ Group related words Lesson 5.6: Weathering – *weathering, sediment* Lesson 5.7: Erosion and Deposition – *erosion, deposition* Lesson 5.8: Wind Changes the Land – *sand dunes* Lesson 5.11: Ice Changes the Land – *glacier* Lesson 5.12: Living Things Change the Land – *organisms* Lesson 5.13: Landslides Change Earth's Surface – *gravity, landslide*
Special Needs Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 5.6: Weathering – *weathering, sediment* Lesson 5.7: Erosion and Deposition – *erosion, deposition* Lesson 5.8: Wind Changes the Land – *sand dunes* Lesson 5.11: Ice Changes the Land – *glacier* Lesson 5.12: Living Things Change the Land – *organisms* Lesson 5.13: Landslides Change Earth's Surface – *gravity, landslide* ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials – Assist in identifying relevant facts or provide previously identified facts ● Modify Format of "Wrap it Up!" questions – Provide sentence starters

	– Provide word banks or key phrases – Allow answers to be given orally

Interdisciplinary Connections

Indicators:
ELA/Literacy-
W.SE.4.6. Gather relevant information from **multiple** print and digital sources; take notes, **prioritize** and categorize information and provide a list of sources.
Mathematics-
MP.2-Reason abstractly and quantitatively. *(4-ESS2-1)*
MP.4-Model with mathematics. *(4-ESS2-1)*
MP.5-Use appropriate tools strategically. *(4-ESS2-1)*
4.M.A.1-Know relative sizes of measurement units within one system of units including km, m, cm. mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.
4.M.A.2- Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

Integration of 21st Century Skills

Indicators:
8.1.5.A.1-Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
8.1.5.A.3-Use a graphic organizer to organize information about a problem or issue.
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.
8.1.5.F.1-Apply digital tools to collect, organize, and analyze data that support a scientific finding.
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.
8.2.5.B.4-Research technologies that have changed due to society's changing needs and wants.
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.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.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.

Unit Title: Unit 6: Earth Science-Natural Hazards

Unit Description:

The students will be introduced to natural hazards. They will learn about earthquakes, tsunamis, and volcanoes, and how to respond to natural hazards.

Unit Duration: 23 Days

Desired Results

New Jersey Student Learning Standard(s):

4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features.

4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes and climate change have on humans.

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.

Indicators:

ESS1.C: The History of Planet Earth

- Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2)

ESS3.B: Natural Hazards

- A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (*Note: This Disciplinary Core Idea can also be found in 3.WC.*)

ETS1.B: Designing Solutions to Engineering Problems

- Testing a solution involves investigating how well it performs under a range of likely conditions. (*secondary to 4-ESS3-2*)

Understandings:

Students will understand that…

- Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed.
- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.
- A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.
- Testing a solution involves investigating how well it performs under a range of likely conditions.

Essential Questions:

- What is a hazard?
- What are some different kinds of hazards caused by natural processes?
- What causes natural hazards?
- How do natural hazards shape the Earth?
- How can human reduce the impact of natural hazards?
- How can humans collect and use information for detect natural hazards early?

Assessment Evidence

Performance Tasks:

Investigate Lessons - Students will practice performance tasks in cooperative groups engaging in scientific steps of an investigation.

- *Lesson 6.3*: Earthquakes (textbook p. 134-135, online text p. 182-183)
  Create a model to show how earthquakes affect structures built on sand or mud.

Think Like an Engineer - Students will engage in performance tasks to design, build, and test a prototype device and analyze and improve results. These tasks will be recorded in their science notebook and evaluated by a Teacher Rubric and Student Rubric.

- *Building for the Future* (textbook p. 150-153, online text p.202-205)
  -Research and describe two ways that engineers have devised to help reduce hazards from earthquakes.
- *Generate and Compare Solutions* (textbook p. 154-157, online textbook p. 206-209)
  -Design and build earthquake resistant buildings.

Think Like a Scientist-Students will engage in performance tasks to plan and conduct an investigation, provide evidence and use that evidence to explain results. These tasks will be recorded in their science notebook and evaluated by a Teacher Rubric and Student Rubric.

- *Analyze and Interpret Data* (textbook p. 148-149, online text p. 200-201)
  Use a world map to analyze the locations of earthquakes and active volcanoes and compare their locations.
- *Identify Evidence* (textbook p.162-165, online text p. 214-217)
  Identify evidence from patterns and fossils to explain how the Grand Canyon has changed over time.

Science Career - Students will engage in performance tasks to learn about careers in science, the work scientists do, and how it connects to the current learning.

- *Crisis Mapper* (textbook p. 166-167)
  Learn about crisis mappers and how they use information from the government and social media to map the impact of natural disasters.

Other Evidence:

- Science Notebook Entries
- Quizzes
  - After Lesson 9 -- “Patterns of Water and Land Features”
- Unit Test
- Life and Earth Science Benchmark

Benchmarks: Life and Earth Science Benchmark will be given after this unit.

Learning Plan

Resources: National Geographic Learning: Exploring Science Teacher's Guide, Student Text Books, Interactive eBook and Website, Laptops, Student Science Notebooks

Learning Activities:

Lesson and Duration	Activities	Materials/Suggested Resources
6.1: Natural Hazards (textbook p. 130-131, online text p. 178-179) **NJSLS: 4-ESS3-2** ESS3.B: Natural Hazards **Objective(s):** ● Identify some natural hazards ● Explain why earthquakes, tsunamis, and volcanic eruptions can be hazardous events **Duration:** 1 Day	**Engage:** *OPTIONAL: View and discuss warning symbol photos.* Share experiences with natural hazards **Explore:** Preview & Read text **Explain:** ● Define hazard ● Identify natural hazards ● Explain why earthquakes, volcanoes, and tsunamis can be hazardous **Elaborate:** *Science Notebook* ● Research & take notes about specific earthquakes, tsunamis, and volcanic eruptions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Photo 1 Photo 2 Photo 3 Photo 4 Photo 5 Photo 6 Photo 7 Research earthquakes, tsunamis, and volcanic eruptions (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book
6.2: Earthquakes (textbook p. 132-133, online text p. 180-181) **NJSLS: 4-ESS3-2** ESS3.B: Natural Hazards **Objective(s):** ● Describe earthquakes ● Identify the hazards to humans that result from earthquakes **Duration:** 1 Day	**Engage:** *OPTIONAL: View and discuss earthquake video in lesson.* Share experiences with water waves **Explore:** Preview & Read text **Explain:** ● Define fault ● Describe earthquakes ● Identify hazards caused by earthquakes **Elaborate:** *Science Notebook* ● Research images and descriptions of Japan Earthquake, March 2011 ● Create collage ● Extend thinking about earthquake hazards **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Earthquake video in lesson in online text. Research Japan Earthquake, March 2011 (students can explore on own or you can provide sites)
6.3: Earthquakes ***INVESTIGATE** (textbook p. 134-135, online text p. 182-183) **NJSLS:** PS3.B, PS3.C **Objective(s):** ● Define liquefaction ● Model what happens during liquefaction **Duration:** 1 Day	**Engage:** *OPTIONAL: View and discuss photo of vehicles sinking due to liquefaction.* Discuss *quicksand* **Explore:** *Science Notebook* ● Preview, Read, & Conduct Investigation in text **Explain:** Share observations & conclusions **Elaborate:** Present & discuss guiding questions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Photo Each group of 4: ● 1 lb. fine-grain sand ● Water ● Rectangular wooden block ● Plastic pan ● Mallet

6.4: Tsunamis (textbook p. 136-137, online text p. 184-185) **NJSLS: 4-ESS3-2** ESS3.B: Natural Hazards **Objective(s):** ● Explain why tsunamis can be hazardous events ● Describe damage caused by tsunamis **Duration:** 1 Day	**Engage:** *OPTIONAL: Complete and discuss teacher-led demo in lesson in online text.* Share experience with large water waves **Explore:** Preview & Read text **Explain:** ● Identify 3 causes of tsunamis ● Explain why tsunamis are dangerous **Elaborate:** *Science Notebook* ● Research tsunami warning systems ○ Produce informational brochure **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: ● glass baking dish or something similar ● sand ● a few toy house or other objects ● piece of cardstock ● water Research tsunami warning systems website (students can explore on own or you can provide sites)
6.5: Volcanoes (textbook p. 138-139, online text p. 186-187) **NJSLS**: **4-ESS3-2** ESS3.B: Natural Hazards **Objective(s)**: ● Explain that volcanic eruptions are natural hazards ● Describe some types of damage caused by volcanic eruptions **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photo of ash-covered land.* Present adages about things that happen quickly and relate to natural hazards **Explore:** Preview & Read text **Explain:** ● Define and contrast magma & lava ● Describe what happens during a volcanic eruption ● Explain why volcanoes can be hazardous **Elaborate:** *Science Notebook* ● Research recent (within 200 years) volcanic eruptions ● Produce timeline **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Photo Research volcanic eruptions (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book OPTIONAL: Mystery Science Task (no additional materials needed)
6.6: Reducing the Impact of Natural Hazards (textbook p. 140-141, online text p. 188-189) **NJSLS**: **4-ESS3-2** ESS3.B: Natural Hazards **Objective(s)**: ● Explain how people can reduce some of the impacts of an earthquake **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photo of San Francisco- Oakland Bay Bridge.* Recall information about earthquakes **Explore:** Preview & Read text **Explain:** ● Explain why bridge was designed to withstand earthquakes ● Explain how bridge was designed to reduce the impact of earthquakes ● *OPTIONAL: View and discuss video, "Plate Tectonics and Natural Hazards".* **Elaborate:** *Science Notebook* ● Research impacts of earthquake on Bay Bridge ○ News article **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Photo OPTIONAL: Video, "Plate Tectonics and Natural Hazards", in online text prior to lesson Research 1989 Earthquake & Bay Bridge (students can explore on own or you can provide sites)

6.7: Early Warning Systems (textbook p. 142-143, online text p. 190-191) **NJSLS**: **4-ESS3-2** ESS3.B: Natural Hazards **Objective**: ● Explain how people can reduce some of the impacts of natural hazards such as earthquakes and volcanic eruptions **Duration**: 1 Day	**Engage:** *OPTIONAL: Role play and discuss a fire breaking out at school.* Recall impacts earthquakes and volcanoes have on humans **Explore:** Preview & Read text **Explain:** ● Explain how some of the impacts of earthquakes can be reduced ● Explain how some of the impacts of volcanic eruptions can be reduced **Elaborate:** *Science Notebook* ● Research instruments used to monitor natural hazards **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	Research seismometers, tiltmeters, instruments used to monitor natural hazards (students can explore on own or you can provide sites)
6.8: Tsunami Detection (textbook p. 144-145, online text p. 192-193) **NJSLS**: **4-ESS3-2** ESS3.B: Natural Hazards **Objective**: ● Explain how a warning system can alert people to possible tsunamis ● Interpret a diagram to explain how the warning system works **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss video of person fishing with a floating bobber.* Recall definition and impacts tsunamis have on humans **Explore:** Preview & Read text **Explain:** ● Explain how impacts of tsunamis can be reduced ● Explain how the tsunami warning system works ● *OPTIONAL: Complete and discuss virtual lab, "Track a Tsunami"* **Elaborate:** *Science Notebook* ● Research "Ring of Fire" **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Video OPTIONAL: Virtual lab, "Track a Tsunami", in online text prior to lesson Research Ring of Fire (students can explore on own or you can provide sites)
6.9: Patterns of Water and Land Features (textbook p. 146-147, online text p. 198-199) **NJSLS**: 4-ESS2-2 ESS2.B: Plate Tectonics and Large Scale System Interactions **Objective**: ● Interpret a map to identify the locations of some land and water features of earth ● Recognize that these features occur in patterns **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss school on Google Earth from several viewpoints.* Define and name mountains **Explore**: Preview & Read text **Explain:** ● Recognize that major mountain chains form inside continents or near their edges ● Compare and contrast some features of the ocean floor **Elaborate:** *Science Notebook* ● Label map with mountain ranges, mid-Atlantic Ridge, and deep ocean trench **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Google Earth Copies of map for this lesson in textbook OPTIONAL: Digital Wrap-Up in Interactive E-book
Quiz 1		

6.10: Analyze and Interpret Data ***THINK LIKE A SCIENTIST** (textbook p. 148-149, online text p. 200-201) **NJSLS**: 4-ESS2-2 **Objective**: ● Analyze and interpret data from maps to describe patterns of Earth's features **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss satellite photo of Hawaiian Islands.* Summarize information about mountains from map in prior lesson **Explore:** Preview & Read text **Explain:** ● Analyze map from prior lesson ● Interpret data from map **Elaborate:** *Science Notebook* ● Research recent earthquake and volcanic activity **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Photo Research recent (within 200 years) earthquake and volcanic activity (students can explore on own or you can provide sites)
6.11: Building for the Future ***THINK LIKE AN ENGINEER** **Case Study** (textbook p. 150-153, online text p. 202-205) **NJSLS**: 4-ESS3-2 ESS3.B: Natural Hazards **Objective**: ● Identify some of the hazards resulting from earthquakes ● Describe two ways that engineers have devised to help reduce the impacts of hazards from earthquakes **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss photos of earthquake-damaged buildings.* Recall definition of earthquake and hazards caused by earthquakes **Explore:** Preview & Read text **Explain:** ● Identify the problem ● Identify the solution **Elaborate:** *Science Notebook* ● Research earthquake resistant buildings ● Present diagrams and descriptions **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: Photo 1 Photo 2 Photo 3 Photo 4 Photo 5 Photo 6 Research earthquake Resistant buildings (students can explore on own or you can provide sites)
6.12: Generate and Compare Solutions ***THINK LIKE AN ENGINEER** (textbook p. 154-157, online text p. 206-209) **NJSLS**: 4-ESS3-2, 3-5- ETS1-2, ETS1.B: Designing Solutions to Engineering Problems **Objective**: ● Generate and compare multiple solutions to reduce the impacts of earthquakes on humans ● Test the solutions to investigate how well they perform under a range of likely earthquake conditions **Duration**: 5 Days	**Engage:** *OPTIONAL: View, describe, and discuss damage done to buildings in photos from prior lesson (above).* *OPTIONAL: Complete and discuss Inside-Outside circle task.* *Science Notebook* ● Discuss observations of photographs on first two pages of prior lesson ● Define problem, criteria, & constraints **Explore:** *Science Notebook* ● Design & build shake table ● Test & Record observations **Explain:** Revise or refine solution **Elaborate:** *Science Notebook* ● Research ways in which structures are designed to withstand earthquakes **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	Each Group of 4 ● Materials for building earthquake-resistant houses ● Materials for building shake tables ● Stopwatches ● Rulers ● Scissors ● Glue ● Staplers ● Markers ● Masking tape *Recommended to start collecting materials several weeks in advance

6.13: The Badlands (textbook p. 158-159, online text p. 210-211) **NJSLS**: **4-ESS1-1** ESS1.C: The History of Planet Earth **Objective**: ● Describe how patterns in rock formations in the Badlands region of South Dakota reveal changes over time ● Explain that the presence and location of certain fossils in the Badlands' rocks indicate the order in which the rock layers were formed **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss background photo in lesson.* Describe fossils **Explore:** Preview & Read text **Explain:** ● Explain how sedimentary rock forms ● Explain what rocks and fossils in South Dakota badlands tell about past **Elaborate:** *Science Notebook* ● Research local & regional rock formations ○ Make postcard from past **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	
6.14: Iceland (textbook p. 160-161, online text p. 212-213) **NJSLS**: 4-ESS1-1 ESS1.C: The History of Planet Earth **Objective**: ● Describe how Earth forces are changing rocks in Iceland **Duration**: 1 Day	**Engage:** *OPTIONAL: View and discuss video about Silfra Fissure in lesson in online text.* Recall information about mid-ocean ranges and volcanoes **Explore:** Preview & Read text **Explain:** ● Locate Iceland ● Explain how volcanic activity is changing Iceland **Elaborate:** *Science Notebook* ● Research how Iceland's volcanoes are changing the land **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	OPTIONAL: Video in lesson in online text Research volcanoes in Iceland (students can explore on own or you can provide sites)
6.15: Identify Evidence ***THINK LIKE A SCIENTIST** (textbook p. 162-165, online text p. 214-217) **NJSLS**: 4-ESS1-1 **Objective**: ● Identify evidence from patterns in rock formations that make up the Grand Canyon to explain how it has changed over time ● Identify evidence from fossils and the rock layers that make up the Grand Canyon to explain how it has changed over time **Duration**: 1 Day	**Engage:** *OPTIONAL: Complete and discuss teacher-led demo.* Recall information about weathering and erosion. **Explore:** Preview & Read text **Explain:** ● Contrast plateaus & canyons ● Review how sedimentary rocks form and change over time ● Introduce rocks and fossils of Grand Canyon ● Interpret diagram **Elaborate:** *Science Notebook* ● Research specific rock formation in the Grand Canyon ○ Make cross section of rock formation **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions	OPTIONAL: **prepare in advance**- layered mold with 5 different colored gelatins, sprinkle rocks/shells/etc throughout layers, remove mold and place on tray; spatula or knife to cut mold Research Grand Canyon (students can explore on own or you can provide sites) OPTIONAL: Digital Wrap-Up in Interactive E-book OPTIONAL: Mystery Science Task (every student needs a glue stick and scissors)

6.16: Crisis Mapper ***SCIENCE CAREER** (textbook p. 166-167, online text p. 220-221) **NJSLS**: Science is way of knowing **Objective**: ● Connect the concepts of real-time social media and online mapping the problem solving during disaster relief **Duration**: 1 Day	**Engage:** *OPTIONAL: Role play and discuss a natural hazard scenario.* Summarize types of natural hazards **Explore:** Preview & Read text **Explain:** Describe what Patrick Meier does as a Crisis Mapper **Elaborate:** *Science Notebook* ● Research disaster relief organizations ○ Present findings **Evaluate:** *Science Notebook* Complete "Wrap it Up!" questions and 4 square diagram	Research disaster relief organizations (students can explore on own or you can provide sites)
Review / Flex Day		
Unit 6 Test **20 pts PBA: Lesson 6.12**		
Benchmark 2 (Life Science and Earth Science)		

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. (Unit 6, Lessons 13-15)**	
4.0	**Students will be able to:** ● **Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time, and provide real world examples.**
3.0	**Students will be able to:** ● **Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.**
2.0	**Students will be able to:** ● **Identify patterns in rock formations and fossils in rock layers.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features. (Unit 6, Lessons 9-10)**	
4.0	**Students will be able to:** ● **Analyze and interpret data from maps to describe patterns of Earth's features, and provide real world examples.**
3.0	**Students will be able to:** ● **Analyze and interpret data from maps to describe patterns of Earth's features.**
2.0	**Students will be able to:** ● **Interpret data from maps of Earth's features.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):	
4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. (Unit 6, Lesson 1-8, 11-12)	
4.0	**Students will be able to:** ● **Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans, and predict how each will benefit humans in the future.**
3.0	**Students will be able to:** ● **Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.**
2.0	**Students will be able to:** ● **Identify how natural Earth processes impact humans.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):	
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. (Unit 6, Lesson 12)	
4.0	**Students will be able to:** ● **Independently 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.**
3.0	**Students will be able to:** ● **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.**
2.0	**Students will be able to:** ● **Generate multiple possible solutions to a problem without considerations for the criteria and constraints of the problem.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit 6 Modifications for Special Population Students	
Advanced Learners	● Use Elaborate sections of the lessons to extend student thinking. Lesson 6.2: Earthquakes - Students make a collage documenting the damage of the Japanese Earthquake in March, 2011. Lesson 6.4: Tsunamis - Students create an informational brochure detailing tsunami warning systems and their effectiveness Lesson 6.5: Volcanoes - Students work in a small group to combine research to create a timeline of geologically recent volcanic eruptions. Lesson 6.6: Reducing the Impact of Natural Hazards - Students write a short news article to explain how the Bay Bridge structure was improved to help reduce the impacts of earthquakes. Lesson 6.11: Building for the Future - Students present research on earthquake-resistant building designs, including a diagram and a description of how the design works. Lesson 6.13: The Badlands - Students use research about regional rock formations and fossils to make a postcard from the past.

	Lesson 6.15: Identify Evidence - Students can quiz themselves about the Grand Canyon using the Brainteaser game at http://kids.nationalgeographic.com/kids/games/geographygames/brainteasergrandcanyon/ Lesson 16: Crisis Mapper - Pairs of students choose a disaster relief organization to present to the class, including what the agency does, the jobs within the agency, and whether the work is paid or volunteer. ● Allow students to complete investigations, Think Like a Scientist, Think Like an Engineer, and Science Careers independently. Lesson 6.3: Earthquakes Lesson 6.10: Analyze and Interpret Data Lesson 6.11: Building for the Future Lesson 6.12: Generate and Compare Solutions Lesson 6.15: Identify Evidence Lesson 6.16: Crisis Mapper
Struggling Learners	● Utilize online student text book with text-to-speech option ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials
English Language Learners	● Utilize online student text book with text-to-speech option ● Preview Vocabulary – Provide visual, verbal, and written examples together – Group related words Lesson 6.1: Natural Hazards - hazard, earthquake, volcano, tsunami Lesson 6.2: Earthquakes - fault Lesson 6.3: Earthquakes (Inv) - liquefaction Lesson 6.5: Volcanoes - magma, erupts, lava Lesson 6.7: Early Warning Systems - seismometer, evacuate, seismographs Lesson 6.9: Patterns of Water and Land Features - mid-ocean range, deep ocean trench Lesson 6.13: The Badlands - sedimentary rock, fossil Lesson 6.14: Iceland - rift Lesson 6.16: Crisis Mapper - crisis mapping
Special Needs Learners	● Utilize online student text book with text-to-speech option ● Preview vocabulary: – Provide visual, verbal, and written examples together – Group related words Lesson 6.1: Natural Hazards - *hazard, earthquake, volcano, tsunami* Lesson 6.2: Earthquakes - *fault* Lesson 6.3: Earthquakes (Inv) - *liquefaction* Lesson 6.5: Volcanoes - *magma, erupts, lava* Lesson 6.7: Early Warning Systems - *seismometer, evacuate, seismographs* Lesson 6.9: Patterns of Water and Land Features - *mid-ocean range, deep ocean trench* Lesson 6.13: The Badlands - *sedimentary rock, fossil* Lesson 6.14: Iceland - *rift* Lesson 6.16: Crisis Mapper - *crisis mapping* ● Provide pre-formatted, partially completed, or fully completed notebook pages ● Provide reading assistance (research) – Use leveled research materials – Assist in identifying relevant facts or provide previously identified facts ● Modify Format of “Wrap it Up!” questions – Provide sentence starters – Provide word banks or key phrases – Allow answers to be given orally

Interdisciplinary Connections

Indicators:

ELA/Literacy-

RI.CR.4.1- Refer to details and examples as textual evidence when explaining what an informational text says explicitly and make relevant connections when drawing inferences from the text.

RI.MF.4.6. Use evidence to show how graphics and visuals (e.g. illustrations, charts, captions, diagrams, tables, animations) **support central ideas.**

W.WR.4.5. Conduct short research projects **that use multiple reference sources (print and non-print) and** build knowledge through investigation of different aspects of a topic.

W.SE.4.6. Gather relevant information from **multiple** print and digital sources; take notes, **prioritize** and categorize information and provide a list of sources.

Mathematics-

MP.2-Reason abstractly and quantitatively. *(4-ESS1-1, 4-ESS3-2)*

MP.4-Model with mathematics. *(4-ESS1-1, 4-ESS3-2)*

4.M.A.1-Know relative sizes of measurement units within one system of units including km, m, cm. mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

4.M.A.2- Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.OA.A.1-Interpret a multiplication equation as a comparison, e.g., interpret 35=5x7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. *(4-ESS3-2)*

Integration of 21st Century Skills

Indicators:

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

8.1.5.A.3-Use a graphic organizer to organize information about a problem or issue.

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.

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

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.

8.2.5.B.4-Research technologies that have changed due to society's changing needs and wants.

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.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.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.

9.2.4.A.3-Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.