Barrington School District | Haddon Heights School District | Lawnside School District | Merchantville School District

Course Name: Science
Grade: 5
Board Approved:

*All curriculum is aligned with the NJSLS in accordance with the Department's curriculum implementation timeline and includes all required components (NJ.A.C.6A:8).
**Resource and activity lists are compiled from all four districts and may not necessarily be reflected in each district or school.

UNIT 1 SUMMARY: In this unit of study, students describe that matter is made of particles too small to be seen by developing a model. The crosscutting concept of scale, proportion, and quantity is called out as an organizing concept for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, and use these practices to demonstrate an understanding of the core ideas.

Unit 1:Properties of Matter

ESTABLISHED GOALS (INDICATOR #)	**TRANSFER (How will this apply to their lives?)**	
★ 5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen. *[Clarification Statement: Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving*	*Students will be able to independently use their knowledge to…* ★ I can develop a model to show how matter is made up of particles too small to be seen. ★ I can make observations and measurements to identify materials based on their properties.	
	MEANING	
	UNDERSTANDINGS	**ESSENTIAL QUESTIONS**

sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.] ★ 5-PS1-3: Make observations and measurements to identify materials based on their properties. *[Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]*	***Students will understand...*** Part A ★ Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. ★ Measurements of a variety of properties can be used to identify materials. (At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) Part B ★ Natural objects exist from the very small to the immensely large. ★ Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by means other than seeing. ★ A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.	Part A ★ How can properties be used to identify materials? Part B ★ What kind of model would best represent/describe matter as made of particles that are too small to be seen**?**

Unit 1: Grade 5- Lessons

The concepts and practices in this unit are foundational for understanding the relationship between changes to matter and its weight. During this unit of study, students will observe, measure, and identify materials based on their properties and begin to get a conceptual understanding of the particle nature of matter (i.e., all matter is made of particles too small to be seen).

In the first portion of the unit, students will focus on measuring and describing a variety of physical properties, including color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces and solubility. These observations and measurements are used to produce data that serves as the basis for evidence that can be used to identify materials. Students need opportunities to observe, measure, and describe a variety of types of matter, such as baking soda and other powders; metals; minerals; and liquids. Standard units should be used to measure the properties of weight, time, temperature, and volume; however, at this grade level, mass and weight are not distinguished. In addition, students are not expected to understand density as a physical property, and no attempt should be made to define unseen particles or explain the atomic-scale mechanism of evaporation and condensation.

In the second portion of the unit, students make observations, gather evidence, and develop models in order to understand that matter is made up of particles too small to be seen. Matter of any type can be subdivided into small particles. In planning and carrying out simple investigations, students will produce data to be used as evidence to support the idea that even though matter is made of particles too small to be seen, matter can still exist and can be detected by means other

than seeing. This evidence will be used to support students' thinking as they develop models that depict matter. For example, a model that represents solids at the particle level would show particles tightly packed, while a model that represents gases would show particles moving freely around in space. Observing such phenomena as adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, or evaporating salt water could help students to understand matter at the particle level and to build models that represent this phenomenon.

Although engineering design is not explicitly called out in this unit, students could incorporate engineering design in a number of ways as they explore the particle nature of matter.

- Students can design ways/tools to measure a given physical property, such as hardness, reflectivity, electrical or thermal conductivity, or response to magnetic forces.
- The engineering design process can be used to analyze students' models using criteria. Then students can improve their designs based on analysis.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations ● Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3) **Developing and Using Models** ● Use models to describe phenomena. (5-PS1-1)	**PS1.A: Structures and Properties of Matter** ● Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3) ● Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)	**Scale, Proportion, and Quantity** ● Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-3) ● Natural objects exist from the very small to the immensely large. (5-PS1-1)

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A ★ Measure and describe physical quantities such as weight, time, temperature, and volume. ★ Make observations and measurements to produce data that can serve as the basis for evidence for an explanation of a phenomenon. ★ Make observations and measurements to identify materials based on their properties. ○ Examples of materials to be identified could include: ■ Baking soda and other powders ■ Metals	Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test

- Minerals
- Liquids
- Examples of properties could include:
  - Color
  - Hardness
  - Reflectivity
  - Electrical conductivity
  - Thermal conductivity
  - Response to magnetic forces Solubility

Part B

★ Develop a model to describe phenomena.

★ Develop a model to describe that matter is made of particles too small to be seen. (Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.)

- Examples of evidence could include:
  - Adding air to expand a basketball
  - Compressing air in a syringe
  - Dissolving sugar in water
  - Evaporating salt water

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Teacher made rubrics Use the following or similar rubric to evaluate students' performance on lesson assessments: Options: **4 - Innovating**: Advanced understanding and application of the standard **3 - Applying**: Consistently applies skills independently **2 - Developing**: Progressing towards independent application of skills **1 - Beginning**: Early stages of development, need assistance	Suggested Performance Tasks: Mystery Matter Activities: Multi-Day- Create Lapbooks before introducing Solving the Mystery of Matter: Use pages 14-26. Pages 14-15 have an individual Mystery Matter Activity that uses a modality of tools to observe mystery materials and identify what each one is based on its own unique properties. Then, using the CER Method, students explain two substances. For Sped, eliminate mystery substances by giving students a list of substances being used. Provide a CER template to answer questions. * A Rubric for Mystery Substances is included.

OR:

4 - Innovating: In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what is expected from the 3.0 goal.

3 - Applying:

Students will be able to:

- Develop a model to describe that matter is made of particles too small to be seen. (5-PS1-1)
- 5-PS1-3: Make observations and measurements to identify materials based on their properties. (5-PS1-3)

2 - Developing:

*Students will **recognize** and **recall** specific vocabulary, including:*

- Particle, solid, liquid, gas, matter, evaporation, condensation, precipitation (5-PS1-1)

Students will be able to:

- Identify an object as a solid, liquid or gas and the phase change that occurs when heat is added or taken away. (5-PS1-1)
- Construct a model to show the arrangement of particles in a solid, liquid and gas. (5-PS1-1)

Students will be able to:

1 - Beginning: With help, partial success at score 2.0 and 3.0 content.

District/School Texts	District/School Supplementary Resources
Haddon Heights: ***Unit Kits for Science Labs and References*** **Barrington: N/A** **Lawnside: Science Fusion (Houghton Mifflin Harcourt - 2017)** **Merchantville: Exploring Science (National Geographic Learning)**	NEWSELA Mystery Science BrainPop Youtube Quizlet Kahoot Readworks PHET Simulations

<u>Interdisciplinary Connections</u>

ELA	Math	Social Studies
RI.5.7: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. W.5.7: Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. W.5.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.	MP.2: Reason abstractly and quantitatively. MP.4: Model with mathematics. MP.5: Use appropriate tools strategically. 5.NBT.A.1: Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. 5.NF.B.7: Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. 5.MD.C.3: Recognize volume as an attribute of solid figures and understand concepts of volume measurement. 5.MD.C.4: Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units.	
21st Century Skills/Career Education	**Technology**	
CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts. 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.	8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools. 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability. 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.	

Modifications and Accommodations		
Special Education Students Small group Direct instruction Restate/rephrase Graphic organizers Modified assignments Chunking Leveled text Intentional grouping Read text Extended time Breaks Teacher records/ student dictates	**English Language Learners** Labels Word banks Visuals Student friendly definitions Extended time Chunking Intentional grouping	**Students at Risk of School Failure** Leveled text Graphic organizers Modified assignments Kinesthetic activities Restate/rephrase Chunking Intentional grouping
Gifted and Talented Extension project Leveled text Leadership roles Intentional grouping Targeted learning from assessment	**Students with 504 Plans** Breaks Chunking Preferential seating Visual reminders Restate/rephrase Check-in/check-out system Visual time Teacher records/ student dictates	
Unit Duration: Instructional Days		
15 days		

UNIT 2 SUMMARY: In this unit of study, students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. The crosscutting concepts of cause and effect and scale, proportion, and quantity are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations and using mathematics and computational thinking. Students are expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on 5-PS1-4 and 5-PS1-2.

Unit 2: Changes to Matter	
ESTABLISHED GOALS (INDICATOR #)	**TRANSFER (How will this apply to their lives?)**

★ 5-PS1-2: Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

★ 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Students will be able to independently use their knowledge to…

★ Describe the process of adding matter to an enclosed area and observing the physical and chemical changes

★ Describe the process of mixing matter and observing the results of the interaction

★ Prove the total weight of matter does not change when there is a change in property

★ Explain the properties that are formed when two different substances are mixed together

MEANING

UNDERSTANDINGS

Students will understand...

Part A

★ Cause-and-effect relationships are routinely identified, tested, and used to explain change.

★ When two or more different substances are mixed, a new substance with different properties may be formed.

Part B

★ Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

★ The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.

★ No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Note: Mass and weight are not distinguished at this grade level.)

★ Science assumes consistent patterns in natural systems.

ESSENTIAL QUESTIONS

Part A

★ How can we make slime?

Part B

★ How can baking soda and vinegar burst a zip-lock bag?

Unit 2: Grade 5- Lessons

In this unit of study, students will use mathematical and computational thinking to understand the cause and effect relationship between physical changes in matter and conservation of weight. Throughout the unit, students need multiple opportunities to observe and document changes in matter due to physical changes, and to analyze data to explain changes that do or do not occur in the physical properties of matter.

Students begin by planning and conducting investigations to determine whether or not a new substance is made when two or more substances are mixed (see the Sample Open Education Resources). As they work with a variety of substances, they should:

- Measure, observe, and document physical properties (e.g., color, mass, volume, size, shape, hardness, reflectivity, conductivity, and response to magnetic forces) of two or three substances.
- Mix the original substances.
- Measure, observe, and document the physical properties of the substance produced when the original substances are mixed.

- Compare data from the original substances to data from the substance produced, and determine what changes, if any, have occurred.
- Use observations and data as evidence to explain whether or not a new substance was produced, and to explain any changes that occurred when the original substances were mixed.

With each set of substances that students investigate, it is important that they use balances to measure the mass of the original substances and the mass of the substance made when the original substances are mixed. These data should be documented so that students can analyze the data. As they compare the data, they should recognize that when two or more substances are mixed, the mass of the resulting substance equals the sum of the masses of the original substances. In other words, the total mass is conserved.

Conservation of mass is a critical concept that is developed over time; therefore, students need multiple opportunities to investigate this phenomenon. Students should measure the mass of each substance, document the data they collect in a table or chart, and use the data as evidence that regardless of the changes that occur when mixing substances, the total weight of matter is conserved.

In addition to observing changes that occur when substances are mixed, students should also have opportunities to investigate other types of physical changes. For example, students can observe changes in matter due to heating, cooling, melting, freezing, and/or dissolving. As before, students should measure, observe, and document the physical properties of the substance before and after a physical change, and use the data as evidence to explain any changes that occur. The data should also provide evidence that regardless of the type of change that matter undergoes, the mass is conserved.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4) **Using Mathematics and Computational Thinking** • Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)	**PS1.A: Structures and Properties of Matter** • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2) **PS1.B: Chemical Reactions** • When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)	**Cause and Effect** • Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4) **Scale, Proportion, and Quantity** • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2) *Connections to Nature of Science* **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes consistent patterns in natural systems. (5-PS1-2)

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A ★ Identify, test, and use cause-and-effect relationships to explain change. ★ Conduct an investigation collaboratively to produce data that can serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered.	Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test

★ Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Part B

★ Measure and describe physical quantities such as weight, time, temperature, and volume.
★ Measure and graph quantities such as weight to address scientific and engineering questions and problems.
★ Measure and graph quantities to provide evidence that regardless of the type of change that occurs when substances are heated, cooled, or mixed, the total weight is conserved. (Note: Assessment does not include distinguishing between mass and weight.)
- Examples of reactions or changes could include:
  - Phase changes
  - Dissolving
  - Mixing

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: **4 - Innovating**: Advanced understanding and application of the standard **3 - Applying**: Consistently applies skills independently **2 - Developing**: Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance	Suggested Performance Tasks: Part A: **Performance Task:** Is the Weight the Same or Different? *In this task, students conduct a hands on investigation to determine how matter, changing state, effects the property of weight.* **Performance Task:** Ice Cubes in a Bag *In this task, students conduct an investigation on the weight of a bag of ice cubes that eventually melts. They predict the outcome, conduct the investigation and explain their answer with evidence from the experiment on why the mass stays the same when the matter changes.* Part B **Performance Task:** Chemical Magic - Mystery 4 (Mystery Science Resource) *In this task, students will develop the idea that chemical reactions create new materials that have useful and interesting properties. In the activity, students conduct an investigation to determine if the mixing of various substances results in a new substance.* **Performance Task:** Changing Matter Day 1 & Changing Matter Day 2 *In this task, students explore the similarities and differences between solutions and mixtures. Students actively mix, filter, and evaporate, to add to their growing wealth of knowledge about the properties of matter. They then use the properties of matter to identify substances. They identify the crystals that result from their evaporation test, and use their knowledge of the properties of matter to try to categorize a new substance.*

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Interdisciplinary Connections

ELA	**Math**	**Social Studies**
W.5.7: Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. W.5.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.	MP.2: Reason abstractly and quantitatively. MP.4: Model with mathematics. MP.5: Use appropriate tools strategically. 5.MD.A.1: Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems.	
21st Century Skills/Career Education	**Technology**	
CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts. 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice.	8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools. 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability. 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.	

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.		
Modifications and Accommodations		
Special Education Students Small group Direct instruction Restate/rephrase Graphic organizers Modified assignments Chunking Leveled text Intentional grouping Read text Extended time Breaks Teacher records/ student dictates	**English Language Learners** Labels Word banks Visuals Student friendly definitions Extended time Chunking Intentional grouping	**Students at Risk of School Failure** Leveled text Graphic organizers Modified assignments Kinesthetic activities Restate/rephrase Chunking Intentional grouping
Gifted and Talented Extension project Leveled text Leadership roles Intentional grouping Targeted learning from assessment	**Students with 504 Plans** Breaks Chunking Preferential seating Visual reminders Restate/rephrase Check-in/check-out system Visual time Teacher records/ student dictates	
Unit Duration: Instructional Days		
15 days		

UNIT 3 SUMMARY: In this unit of study, students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment, and they can explain that energy in animals' food was once energy from the sun. The crosscutting concepts of energy and matter and systems and system models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in developing and using models and engaging in argument from evidence. Students are also expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on 5-LS1-1, 5-LS2-1, and 5-PS3-1.

Unit 3: Energy and Matter in Ecosystems	
ESTABLISHED GOALS (INDICATOR #)	**TRANSFER (How will this apply to their lives?)**

★ 5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.
★ 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
★ 5-PS3-1: Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

Students will be able to independently use their knowledge to…

★ Describe and explain that plant growth come directly from air and water
★ Demonstrate the methods by which matter and moves within plants, animals and decomposers through modeling

MEANING

UNDERSTANDINGS

Students will understand...

Part A

★ Matter is transported into, out of, and within systems.
★ Plants acquire their material for growth chiefly from air and water.

Part B

★ Science explanations describe the mechanisms for natural events.
★ A system can be described in terms of its components and their interactions.
★ The food of almost any kind of animal can be traced back to plants.
★ Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants.
★ Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as decomposers.
★ Decomposition eventually restores (recycles) some materials back to the soil.
★ Organisms can survive only in environments in which their particular needs are met.

Part C

★ Energy can be transferred in various ways and between objects.
★ The energy released from food was once energy from the sun, which was captured by plants in the chemical process that

ESSENTIAL QUESTIONS

Part A

★ Where do plants get the materials they need for growth?

Part B

★ How does matter move among plants, animals, decomposers, and the environment?

Part C

★ How can energy in animals' food be traced to the sun?

	forms plant matter (from air and water). ★ Food provides animals with the materials they need for body repair and growth and the energy they need for motion and to maintain body warmth	

Unit 3: Grade 5- Lessons

In every habitat and ecosystem on Earth, plants and animals survive, grow, reproduce, die, and decay. What happens to the matter and energy that are part of each organism? Where does it come from and where does it go? In this unit of study, students make observations and use models to understand how energy flows and matter cycles through organisms and ecosystems.

Students should first understand that plants acquire their material for growth chiefly from air and water. Students will need opportunities to observe a variety of plants over time. As students document plants' continual need for water and air in order to grow, they recognize that this evidence supports the argument that plants acquire their material for growth chiefly from air and water (not from soil). In addition, as students observe that plants also need sunlight, they begin to recognize that plants use energy from the sun to transform air and water into plant matter.

Once students understand that plants acquire material for growth from air and water, they need opportunities to observe animals and plants interacting within an ecosystem. Terrariums, such as those built in 3-liter bottles, are ideal for this because they are large enough for small plants and animals to survive and grow, yet easy to build and maintain. In these terrariums, students should observe plants growing and providing a source of food for small herbivores, carnivores consuming other animals, and decomposers consuming dead plant material.

All of these interactions may not be observable within a single terrarium; however, a class could use a number of 3-liter bottles to set up different ecosystems, each with a few carefully chosen plants and animals. This will give students opportunities to observe different types of interactions within a variety of enclosed systems.

When students record their observations of these small systems, it is important that students be able to:

- Identify the living and nonliving components of a system.
- Describe the interactions that occur between the living and nonliving components of each system.
- Develop models (such as food chains or food webs) that describe the movement of matter among plants, animals, decomposers, and the environment

As students continue to observe each terrarium, they learn that:

- The food of almost any kind of animal can be traced back to plants.
- Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants.
- Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as decomposers.
- Decomposition eventually restores (recycles) some materials back to the soil.
- A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life.
- Organisms can survive only in environments in which their particular needs are met.
- Matter cycles between the air and soil and among plants and animals as these organisms live and die.
- Organisms obtain gases and water from the environment and release waste matter (gas, liquid, or solid) back into the environment.

Furthermore, students can conduct research to determine the effects of newly introduced species to an ecosystem.

After investigating the movement of matter in ecosystems, students revisit the concept of energy flow in systems. At the beginning of this unit of study, students learned that energy from the sun is transferred to plants, which then use that energy to change air and water into plant matter. After observing the interactions between the living and nonliving components of small ecosystems, students recognize that energy, like matter, is transferred from plants to animals. When animals consume plants, that food provides animals with the materials they need for body repair and growth and with the energy they need to maintain body

warmth and for motion. Students can use diagrams or flowcharts to describe the flow of energy within an ecosystem, tracing the energy in animals' food back to the energy from the sun that was captured by plants.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence • Support an argument with evidence, data, or a model. (5-LS1-1) **Developing and Using Models** • Develop a model to describe phenomena. (5-S2-1) • Use models to describe phenomena. (5-PS3-1)	**LS1.C: Organization for Matter and Energy Flow in Organisms** • Plants acquire their material for growth chiefly from air and water. (5-LS1-1) **LS2.A: Interdependent Relationships in Ecosystems** • The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1) **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems** • Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1) **PS3.D: Energy in Chemical Processes and Everyday Life**	**Energy and Matter** • Matter is transported into, out of, and within systems. (5-LS1-1) • Energy can be transferred in various ways and between objects. (5-PS3-1) **Systems and System Models** • A system can be described in terms of its components and their interactions. (5-LS2-1) *Connections to the Nature of Science* **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Science explanations describe the mechanisms for natural events. (5-LS2-1)

	• The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1) **LS1.C: Organization for Matter and Energy Flow in Organisms** • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1)	
District/School Formative Assessment Plan		**District/School Summative Assessment Plan**
Part A ★ Describe how matter is transported into, out of, and within systems. ★ Support an argument with evidence, data, or a model. ★ Support an argument that plants get the materials they need for growth chiefly from air and water. (Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.) **Part B** ★ Describe a system in terms of its components and interactions. ★ Develop a model to describe phenomena. ★ Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (Assessment does not include molecular explanations.) ★ Emphasis is on the idea that matter that is not food—such as air, water, decomposed materials in soil—is changed into matter that is food. ○ Examples of systems could include: ■ Organisms ■ Ecosystems ■ Earth **Part C** ★ Describe how energy can be transferred in various ways and between objects. ★ Use models to describe phenomena. ★ Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. ○ Examples of models could include: ■ Diagrams ■ Flowcharts		Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test
Alternative Assessments		

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: **4 - Innovating: Advanced understanding and application of the standard** **3 - Applying: Consistently applies skills independently** **2 - Developing: Progressing towards independent application of skills** **1 - Beginning: Early stages of development, need assistance**	Suggested Performance Tasks: Bottle Biology Terrarium: Students will create a terrarium, make observations of the terrarium, then develop a model to explain how matter transfers within the ecosystem. This resource describes the process of creating a terrarium (which will serve as the phenomena that the students observe), but does not include specific lesson details or instructional strategies. Biodomes Engineering Design Project: This activity is a culmination of a 15 day unit of study where students explore the biosphere's environments and ecosystems. In this final activity, students apply what they learned about plants, animals, and decomposers to design and create a model biodome. Engaging in the engineering design process, students construct a closed (system) environment containing plants and animals existing in equilibrium. Provided with a variety of materials (constraints), teams of students will use their imagination and culminating knowledge to design a biodome structure following the criteria of the activity that models how plants, insects, and decomposers work together in a system. (The activity can be conducted as a structured or open-ended design. It is recommended to allow students the opportunity to be true engineers and follow the opened-ended design.)

District/School Texts	District/School Supplementary Resources
Haddon Heights: ***Unit Kits for Science Labs and References*** **Barrington: N/A** **Lawnside: Science Fusion (Houghton Mifflin Harcourt - 2017)** **Merchantville: Exploring Science (National Geographic Learning)**	NEWSELA Mystery Science BrainPop Youtube Quizlet Kahoot Readworks PHET Simulations

Interdisciplinary Connections

ELA	Math	Social Studies
RI.5.1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. RI.5.7: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. RI.5.9: Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. W.5.1: Write opinion pieces on topics or texts, supporting a point of view with reasons and information. SL.5.5: Include multimedia components (e.g., graphics, sound) and visual displays in	MP.2: Reason abstractly and quantitatively. MP.4: Model with mathematics. MP.5: Use appropriate tools strategically. 5.MD.A.1: Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.	

presentations when appropriate to enhance the development of main ideas or themes.		
21st Century Skills/Career Education CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts. 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.	**Technology** 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools. 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability. 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.	
Modifications and Accommodations		
Special Education Students Small group Direct instruction Restate/rephrase Graphic organizers Modified assignments Chunking Leveled text Intentional grouping Read text Extended time Breaks Teacher records/ student dictates	**English Language Learners** Labels Word banks Visuals Student friendly definitions Extended time Chunking Intentional grouping	**Students at Risk of School Failure** Leveled text Graphic organizers Modified assignments Kinesthetic activities Restate/rephrase Chunking Intentional grouping
Gifted and Talented Extension project Leveled text Leadership roles Intentional grouping Targeted learning from assessment	**Students with 504 Plans** Breaks Chunking Preferential seating Visual reminders Restate/rephrase	

	Check-in/check-out system Visual time Teacher records/ student dictates	
Unit Duration: Instructional Days		
15 days		

UNIT 4 SUMMARY: In this unit of study, students describe and graph data to provide evidence about the distribution of water on Earth. The crosscutting concepts of scale, proportion, quantity and systems, and systems models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade appropriate proficiency in using mathematics and computational thinking and in obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on 5-ESS2-2 and 5-ESS3-1.

Unit 4: Water on the Earth

ESTABLISHED GOALS (INDICATOR #)

- ★ 5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
- ★ 5-ESS2-2: Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

TRANSFER (How will this apply to their lives?)

Students will be able to independently use their knowledge to…

- ★ I can explain how my community can/is working to use science-based ideas to protect Earth's resources and the environment.
- ★ I can explain how water is distributed on Earth by graphing and then describing the amounts and percentages of water in various locations.

MEANING

UNDERSTANDINGS

Students will understand...

Part A

- ★ Standard units are used to measure and describe physical quantities such as weight and volume.
- ★ Nearly all of Earth's available water is in the ocean.
- ★ Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.

Part B

- ★ A system can be described in terms of its components and their interactions.
- ★ Science findings are limited to questions that can be answered with empirical evidence.
- ★ Human activities in agriculture, industry,

ESSENTIAL QUESTIONS

Part A

- ★ Where is water found on the Earth? What percentage of the Earth's water is freshwater?

Part B

- ★ How do individual communities use science ideas to protect Earth's resources and environment?

	and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. ★ Individuals and communities are doing things to help protect Earth's resources and environments.	

Unit 4: Grade 5- Lessons

During this unit of study, students need to understand that Earth is a system made up of subsystems, all of which have multiple components that interact. Throughout this unit, students will consider scale and proportion when examining the amount of water on the Earth, and they will consider the impact that humans have on one of Earth's most valuable resources.

To begin the progression of learning in this unit, students conduct research, using informational texts and online resources, to determine the distribution of freshwater and saltwater among Earth's oceans, rivers, lakes, glaciers, groundwater, and polar ice caps. Students organize their data into graphs or charts, showing the allocation of freshwater and saltwater on Earth. (Amounts should be described in terms of volume, as well as in percentages.) After comparing and analyzing data, students should be able to conclude the following:

- Nearly all of Earth's available water is in the ocean.
- Freshwater makes up less than 3% of the total amount of water on the Earth.
- Most freshwater is found in glaciers or underground.
- Only a tiny fraction of the freshwater on Earth is in streams, lakes, wetlands, and the atmosphere.

Next, students conduct research in order to determine ways in which individuals and communities help to protect the Earth's resources and environments. Using books and other reliable media resources, as well as first-hand observations in the local community, students gather information about the ways in which humans affect the environment. They should look for examples of human activities in agriculture, industry, and in their everyday lives, and should describe, both orally and in writing, the ways in which these activities affect the land, oceans, streams, groundwater, air, and other organisms (both plants and animals). Students will need the opportunity to share their findings with the class, and then should conduct further research to find ways in which individual communities use science ideas to protect the Earth's resources and environments.

Working in pairs or small groups, students should gather relevant information from both observations and reliable resources to prepare a presentation that explains one way in which a community is minimizing the effects of human activities on Earth's resources and environment. The presentation should include both writing and speaking components, as well as a list of sources that were used to provide information. As a result of conducting research and creating a presentation, students should come to understand that the ecosystem is a system that includes both living and nonliving components that interact with one another. These interactions cause changes to the system and its components. Humans are just one of many components in an ecosystem, yet our activities affect all parts of the ecosystem, many times in adverse ways.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking • Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2) **Obtaining, Evaluating, and Communicating Information**	**ESS2.C: THe Roles of Water in Earth's Surface Processes** • Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands and the atmosphere. (5-ESS2-2)	**Scale, Proportion, and Quantity** • Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2) **Systems and System Models**

• Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)	**ESS3.C: Human Impacts on Earth Systems** • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments (5-ESS3-1)	• A system can be described in terms of its components and their interactions. (5-ESS3-1) *Connections to the Nature of Science* **Science Addresses Questions About the Natural and Material World.** • Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1)

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A ★ Describe physical quantities, such as weight and volume, in standard units. ★ Describe and graph quantities such as area and volume to address scientific questions. ★ Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. **Part B** ★ Describe a system in terms of its components and interactions. ★ Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. ★ Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: 4 - Innovating: Advanced understanding and application of the standard 3 - Applying: Consistently applies skills independently 2 - Developing: Progressing towards independent application of skills 1 - Beginning: Early stages of development, need assistance **OR** **4 - Innovating:** In addition to score 3.0 performance, the student demonstrates in-depth	Suggested Performance Tasks: **Better lesson activities-good resources for measurement** • **Distribution of Water on Earth Activity WITH Data Analysis used as formative assessment** • NOAA What-a-Cycle: Through role-playing as a particle of water, students gain an understanding of the complexity of the movement of water through earth's systems. Stations are set-up for nine different water reservoirs associated with the water cycle. On each turn, students roll the dice at each station and either stay in place or move to a different location. Students track their unique journey through the water cycle to later share and discuss the strengths and limitations of the game as a model for the movement of water through Earth's systems. Assess by having students describe the system in terms of its components and interactions. Modify as needed with essay/sentence starters based on ability level. *Provide teacher-made rubric for all.

inferences and applications that go beyond what is expected from the 3.0 goal.

3 - Applying:

Students will be able to:

- 5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
- 5-PS1-3: Make observations and measurements to identify materials based on their properties.

2 - Developing:

*Students will **recognize** and **recall** specific vocabulary, including:* resources, reservoir, agriculture, percentages, freshwater, standard units.

Students will be able to:

- identify 2 ways in which their community uses science ideas to protect the earth's resources and environment.

Students will be able to:

- make measurements and identify properties of freshwater and saltwater.

1 - Beginning: With help, partial success at score 2.0 and 3.0 content.

District/School Texts	District/School Supplementary Resources
Haddon Heights: ***Unit Kits for Science Labs and References*** **Barrington: N/A** **Lawnside: Science Fusion (Houghton Mifflin Harcourt - 2017)** **Merchantville: Exploring Science (National Geographic Learning)**	NEWSELA Mystery Science BrainPop Youtube Quizlet Kahoot Readworks PHET Simulations

<u>Interdisciplinary Connections</u>

ELA	Math	Social Studies
RI.5.1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. RI.5.7: Draw on information from multiple print or digital sources, demonstrating the ability to	MP.2: Reason abstractly and quantitatively. MP.4: Model with mathematics.	6.1.8.B.1.b Analyze the world in spatial terms (e.g., longitude, latitude) using historical maps to determine what led to the exploration of new water and land routes.

locate an answer to a question quickly or to solve a problem efficiently. RI.5.9: Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. W.5.9: Draw evidence from literary or informational texts to support analysis, reflection, and research. SL.5.5: Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.		6.1.8.C.1.b Explain why individuals and societies trade, how trade functions, and the role of trade during this period.
21st Century Skills/Career Education CRP2. Apply appropriate academic and technical skills. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence. 9.1.8.E.1 Explain what it means to be a responsible consumer and the factors to consider when making consumer decisions. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts.	**Technology** 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.	

9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.		
Modifications and Accommodations		
Special Education Students Small group Direct instruction Restate/rephrase Graphic organizers Modified assignments Chunking Leveled text Intentional grouping Read text Extended time Breaks Teacher records/ student dictates	**English Language Learners** Labels Word banks Visuals Student friendly definitions Extended time Chunking Intentional grouping	**Students at Risk of School Failure** Leveled text Graphic organizers Modified assignments Kinesthetic activities Restate/rephrase Chunking Intentional grouping
Gifted and Talented Extension project Leveled text Leadership roles Intentional grouping Targeted learning from assessment	**Students with 504 Plans** Breaks Chunking Preferential seating Visual reminders Restate/rephrase Check-in/check-out system Visual time Teacher records/ student dictates	
Unit Duration: Instructional Days		
15 days		

UNIT 5 SUMMARY: In this unit of study, students are able to describe ways in which the geosphere, biosphere, hydrosphere, and atmosphere interact. The crosscutting concept of systems and system models is called out as an organizing concept for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in developing and using models, obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on 5-ESS2-1 and 5-ESS3-1.

Unit 5: Earth Systems

<table>
<tr><th>ESTABLISHED GOALS (INDICATOR #)</th><th colspan="2">TRANSFER (How will this apply to their lives?)</th></tr>
<tr><td rowspan="3">★ 5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
★ 5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.</td><td colspan="2">Students will be able to independently use their knowledge to…
★ Demonstrate the interactions of the geosphere, biosphere, hydrosphere and atmosphere through modeling.
★ Analyze the scientific ways by which local communities conserve and protect environmental resources.</td></tr>
<tr><th colspan="2">MEANING</th></tr>
<tr><td>UNDERSTANDINGS
Students will understand...
Part A
★ A system can be described in terms of its components and their interactions.
★ Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans).
★ The Earth's major systems interact in multiple ways to affect Earth's surface materials and processes.
★ The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate.
★ Winds and clouds in the atmosphere interact with landforms to determine patterns of weather.

Part B
★ A system can be described in terms of its components and their interactions.
★ Science findings are limited to questions that can be answered with empirical evidence.
★ Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
★ Individuals and communities are doing things to help protect Earth's resources and environments.</td><td>ESSENTIAL QUESTIONS
Part A
★ In what ways do the geosphere, biosphere, hydrosphere, and/or atmosphere interact?

Part B
★ How do individual communities use science ideas to protect Earth's resources and environment?</td></tr>
<tr><td colspan="3">Unit 4: Grade 5- Lessons</td></tr>
</table>

In this unit of study, students develop models to describe the interactions that occur within and between major Earth systems and conduct research to learn how humans protect the Earth's resources.

Foundational to this unit of study is the understanding of a system, its components, and the interactions that occur within the system. Initially, students may need opportunities to review familiar examples of systems, such as plants and animals, listing external and internal structures and processes and describing the interactions that occur within the system. Students can then begin to think about Earth's major systems, identifying the components and describing the interactions that occur within each. For example:

- The geosphere is composed of solid and molten rock, soil, and sediments. Some processes that occur between the components of the geosphere include erosion, weathering, deposition, sedimentation, compaction heating, cooling, and flow. These processes cause continual change to rock, soil, and sediments.
- The hydrosphere is composed of water in all its forms. Water, unlike the vast majority of earth materials, occurs naturally on the Earth as a solid, liquid, or gas, and it can be found on, above, and below the surface of the Earth. Some processes that occur in the hydrosphere include evaporation, condensation, precipitation, run-off, percolation, freezing, thawing, and flow. These processes cause water to change from one form to another in a continuous cycle. The atmosphere is a critical system made up of the gases that surround the Earth.
- The atmosphere helps to regulate Earth's climate and distribute heat around the globe, and it is composed of layers with specific properties and functions. This system, composed mainly of nitrogen, oxygen, argon, and carbon dioxide, also contains small amounts of other gases, including water vapor, which is found in the lowest level of the atmosphere where weather-related processes occur. In addition to weather processes, radiation, conduction, convection, carbon cycling, and the natural greenhouse effect are processes that occur in the atmosphere.
- The biosphere comprises living things, including humans. Living organisms can be found in each of the major systems of the Earth (the atmosphere, hydrosphere, and geosphere). Some processes that occur within the biosphere include transpiration, respiration, reproduction, photosynthesis, metabolism, growth, and decomposition.

As students become more comfortable with describing each system in terms of its components and interactions, they should begin to think about and discuss the interactions that occur between systems. This should be a natural progression in their learning, since students will discover that any interactions that occur within a system affect components of other systems. Students should develop models that describe ways in which any two Earth systems interact and how these interactions affect the living and nonliving components of the Earth. Some examples include:

- The influence of oceans on ecosystems, landform shape, or climate.
- The impact of the atmosphere on landforms or ecosystems through weather and climate.
- The influence of mountain ranges on wind and clouds in the atmosphere.
- The role of living organisms (both plants and animals) in the creation of soils.

As a class, students can brainstorm additional examples. They can use any type of model, such as diagrams or physical replicas, to describe the interactions that occur between any two systems, and they can choose to enhance the model with multimedia components or visual displays.

Once students have an understanding of the components and interactions that occur within and between Earth's major systems, they should gather information about the ways in which individual communities use science ideas to protect Earth's resources and environment. Students can work individually, in pairs, or in small groups to conduct research using books and other reliable media resources. They should paraphrase and summarize information as they take notes, then use their information to support their finished work. Students' research should help them determine:

- How human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air and even outer space.
- What individuals and communities are doing to help protect Earth's resources and the environment.

Students can share their work in a variety of ways and should provide a list of sources for the information in their finished work.

Although engineering design is not explicitly called out in this unit, students could incorporate engineering design in a number of ways as they explore human impact on the environment.

- Students may design a way to promote local, sustainable agriculture, making healthy food available to more people in their communities while minimizing the impacts on the local environment.
- Students can design ways to capture and use rainwater throughout their community to lessen the impact on local freshwater reserves.
- Students can design and implement a variety of recycling projects that have a positive impact on the environment by increasing the reuse of materials that normally end up in landfills and decreasing our reliance on earth resources.
- Students can research and design ways to increase the use of environmentally friendly fertilizers and pesticides that do not harm the local environment. Students can create pamphlets, presentations, or even commercials that inform the local community of the impacts that chemical fertilizers and pesticides have when used in and around homes and businesses and offer information on safer alternatives that are just as effective.

Students will need time to conduct research, determine criteria for success, consider constraints on available resources, and design solutions based on the information they gather. Students will need access to reliable sources of information that will help them as they work through the design process.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models ● Develop a model using an example to describe a scientific principle. (5-ESS2-1) **Obtaining, Evaluating, and Communicating Information** ● Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)	**ESS2.A: Earth Materials and Systems** ● Earth's major systems are the geosphere (soil and molten rock, soil and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1) **ESS3.C: Human Impacts on Earth Systems** ● Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments (5-ESS3-1)	**Systems and System Models** ● A system can be described in terms of its components and their interactions. (5-ESS2-1), (5-ESS3-1) ***Connections to the Nature of Science*** **Science Addresses Questions About the Natural and Material World.** ● Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1)

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A ★ Describe a system in terms of its components and interactions.	Teacher created tests Individual/Group Presentations

★ Develop a model using an example to describe a scientific principle. ★ Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. ★ Examples could include: ○ The influence of oceans and ecosystems, landform shape, and climate. ○ The influence of the atmosphere on landforms and ecosystems through weather and climate. ○ The influence of mountain ranges on the wind and clouds in the atmosphere. **Part B** ★ Describe a system in terms of its components and interactions. ★ Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. ★ Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	Unit projects End of the Unit Writing Project with a rubric End of Unit Test

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: **4 - Innovating**: Advanced understanding and application of the standard **3 - Applying**: Consistently applies skills independently **2 - Developing**: Progressing towards independent application of skills **1 - Beginning**: Early stages of development, need assistance	Suggested Performance Tasks: Shower Curtain Watershed: What is a watershed? How do our actions affect the health of a watershed? Students explore these questions by analyzing pictures and identifying watershed features. Students then make a watershed model using a plastic shower curtain, a spray bottle of water and themselves or classroom objects The objectives of the lesson are to: a) Identify nonliving and living features found in a watershed. b) Understand how human activities can affect watersheds. Investigating Water Transformations- The Aral Sea Lab Activities and Cartoon Assessment-18 Investigations

District/School Texts	District/School Supplementary Resources
Haddon Heights: ***Unit Kits for Science Labs and References*** **Barrington: N/A** **Lawnside: Science Fusion (Houghton Mifflin Harcourt - 2017)** **Merchantville: Exploring Science (National Geographic Learning)**	NEWSELA Mystery Science BrainPop Youtube Quizlet Kahoot Readworks PHET Simulations

Interdisciplinary Connections

ELA RI.5.1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. RI.5.7: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. RI.5.9: Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. W.5.9: Draw evidence from literary or informational texts to support analysis, reflection, and research. SL.5.5: Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.	**Math** MP.2: Reason abstractly and quantitatively. MP.4: Model with mathematics. 5.G.A.2: Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.	**Social Studies** 6.1.8.C.1.a Evaluate the impact of science, religion, and technology innovations on European exploration.
21st Century Skills/Career Education CRP2. Apply appropriate academic and technical skills. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.	**Technology** 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.	

9.1.8.E.1 Explain what it means to be a responsible consumer and the factors to consider when making consumer decisions. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts. 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.		
Modifications and Accommodations		
Special Education Students Small group Direct instruction Restate/rephrase Graphic organizers Modified assignments Chunking Leveled text Intentional grouping Read text Extended time Breaks Teacher records/ student dictates	**English Language Learners** Labels Word banks Visuals Student friendly definitions Extended time Chunking Intentional grouping	**Students at Risk of School Failure** Leveled text Graphic organizers Modified assignments Kinesthetic activities Restate/rephrase Chunking Intentional grouping
Gifted and Talented Extension project Leveled text Leadership roles Intentional grouping Targeted learning from assessment	**Students with 504 Plans** Breaks Chunking Preferential seating Visual reminders Restate/rephrase Check-in/check-out system Visual time Teacher records/ student dictates	
Unit Duration: Instructional Days		
20 days		

UNIT 6 SUMMARY: In this unit of study, students develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. The crosscutting concepts of patterns, cause and effect, and scale, proportion, and quantity are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in analyzing and interpreting data and engaging in argument from evidence. Students are also expected to use these practices to demonstrate an understanding of the core ideas.
This unit is based on 5-PS2-1, 5-ESS1-1, and 5-ESS1-2.

Unit 6: Interactions Within the Earth, Sun and Moon System

ESTABLISHED GOALS (INDICATOR #)

- ★ 5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.
- ★ 5-ESS1-1: Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.
- ★ 5-ESS1-2: Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

TRANSFER (How will this apply to their lives?)

Students will be able to independently use their knowledge to…

- ★ Describe the relative size of the Sun compared to other recognized stars
- ★ Create a model that shows the gravitational force on Earth pulling objects to the center of the planet
- ★ Describe how the gravitational force may be different in other places in the solar system
- ★ Show how the length of day and night is affected by the rotation and orbit of both the Earth and the moon
- ★ Describe seasons and how they are impacted by the Earth's orbit and rotation on its axis
- ★ Explain why shadows change throughout the day
- ★ Explain why the sun, moon, and stars are at different positions at different times of the day, month and year

MEANING

UNDERSTANDINGS

Students will understand...

Part A

- ★ Cause-and-effect relationships are routinely identified and used to explain change.
- ★ The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.

Part B

- ★ Natural objects exist from the very small to the immensely large.
- ★ The sun is a star that appears larger and brighter than other stars because it is closer.
- ★ Stars range greatly in their distance from Earth.

Part C

- ★ Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates

ESSENTIAL QUESTIONS

Part A

- ★ What effect does Earth's gravitational force have on objects?

Part B

- ★ What effect does the relative distance from Earth have on the apparent brightness of the sun and other stars? Concepts Format.

Part C

- ★ What patterns do we notice when observing the sky?

	of change for natural phenomena. ★ The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its north and south poles, cause observable patterns. These include: ○ Day and Night ○ Daily changes in the length and direction of shadows ○ Different positions of the sun, moon, and stars at different times of the day, month and year.	

Unit 6: Grade 5- Lessons

In this unit of study, students explore the effects of gravity and determine the effect that relative distance has on the apparent brightness of stars. They also collect and analyze data in order to describe patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

To begin the progression of learning in this unit, students explore the effects of gravity by holding up and releasing a variety of objects from a variety of heights and locations. Students should record and use their observations to describe the interaction that occurs between each object and the Earth. In addition, students should use their observations as evidence to support an argument that the gravitational force exerted by the Earth on objects is directed "down" (towards the center of the Earth), no matter the height or location from which an object is released.

Next, students investigate the effect of distance on the apparent brightness of stars. Using information from a variety of print or digital sources, students learn that natural objects vary in size, from very small to immensely large. Stars, which vary in size, also range greatly in their distance from the Earth. The sun, which is also a star, is much, much closer to the Earth than any other star in the universe. Once students understand these concepts, they should explore the effect of distance on the apparent brightness of the sun in relation to other stars. This can be accomplished by modeling the effect using a light source, such as a bright flashlight. As students vary the distance of the light from their eyes, they should notice that the farther away the light is, the less bright it appears. Observations should again be recorded and used as evidence to support the argument that the differences in the apparent brightness of the sun compared to that of other stars is due to their relative distances from the Earth.

To continue the progression of learning, students investigate the following observable patterns of change that occur due to the position and motion of the Earth, sun, moon, and stars.

- **Day and night:** This pattern of change is a daily, cyclical pattern that occurs due to the rotation of the Earth every 24 hours. Students can observe model simulations using online or digital resources, or they can create models in class of the day/night pattern caused by the daily rotation of the Earth.
- **The length and direction of shadows:** These two interrelated patterns of change are daily, cyclical patterns that can be observed and described through direct observation. Students need the opportunity to observe a stationary object at chosen intervals throughout the day and across a few days. They should measure and record the length of the shadow and record the direction of the shadow (using drawings and cardinal directions), then use the data to describe the patterns observed.
- **The position of the sun in the daytime sky:** This daily, cyclical pattern of change can also be directly observed. Students will need the opportunity to make and record observations of the position of the sun in the sky at chosen intervals throughout the day and across a few days. Data should then be analyzed in order to describe the pattern observed.

- **The appearance of the moon in the night sky:** This cyclical pattern of change repeats approximately every 28 days. Students can use media and online resources to find data that can be displayed graphically (pictures in a calendar, for example), which will allow them to describe the pattern of change that occurs in the appearance of the moon every four weeks.
- **The position of the moon in the night sky:** This daily, cyclical pattern of change can be directly observed, but students would have to make observations of the position of the moon in the sky at chosen intervals throughout the night, which is not recommended. Instead, students can use media and online resources to learn that the moon, like the sun, appears to rise in the eastern sky and set in the western sky every night.
- **The position of the stars in the night sky:** Because the position of the stars changes across the seasons, students will need to use media and online resources to learn about this pattern of change.

Whether students gather information and data from direct observations or from media and online sources, they should organize all data in graphical displays so that the data can be used to describe the patterns of change.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Develop a model using an example to describe a scientific principle. (5-ESS2-1) **Engaging in Argument from Evidence** • Support an argument with evidence, data, or a model. (5-PS2-1), (5-ESS1-1) **Analyzing and Interpreting Data** • Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2).	**PS2.B: Types of Interactions** • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1) **ESS1.A: The Universe and its Stars** • The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1) **ESS1.B: Earth and the Solar System** • The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and difference positions of the sun, moon, and stars at different times of the day, month and year. (5-ESS1-2)	**Cause and Effect** • Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1) **Scale, Proportion, and Quantity** • Natural objects exist from the very small to the immensely large. (5-ESS3-1) **Patterns** • Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2)

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A ★ Identify cause-and-effect relationships in order to explain change. ★ Support an argument with evidence, data, or a model. ★ Support an argument that the gravitational force exerted by Earth on objects is directed down. ("Down" is a local description of the direction that points toward the center of the spherical Earth.) **Part B** ★ Support an argument with evidence, data, or a model. ★ Support an argument that differences in the apparent brightness of the sun compared to that of other stars is due to their relative distances from Earth. **Part C** ★ Sort, classify, communicate, and analyze simple rates of change for natural phenomena using similarities and differences in patterns. ★ Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. ★ Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. Examples of patterns could include: ○ The position and motion of Earth with respect to the sun. ○ Selected stars that are visible only in particular months.	Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: **4 - Innovating:** Advanced understanding and application of the standard **3 - Applying:** Consistently applies skills independently **2 - Developing**: Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance	Suggested Performance Tasks: Part A (5-PS2-1) **Performance Task:** Recreating Galileo's Leaning Tower of Pisa Investigation *In this task, students will use the Scientific Method to test the rates at which a tennis ball and a plastic ball fall to Earth.* **Performance Task:** Spaceship Earth - Mystery 7 (Mystery Science Resource) *In this task, students discover that gravity exists on all planets and moons, but the amount of gravity is different because it depends on how massive the object is. In the activity, students measure how high they can jump on Earth and then calculate how high they could jump on other places in our Solar System.* Part B (5-ESS1-1) **Performance Task:** Investigating Star Brightness and Distance

	In this task, students explore the brightness of stars by examining a photo of the night sky. Then, students use flashlights to investigate how distance impacts star brightness. **Performance Task:** Spaceship Earth - Mystery 8 *In this task, students discover that the Earth is in the "Goldilocks Zone" — a distance from the Sun with the right amount of light and heat for life to exist. In the activity, students evaluate other solar systems and plan a space mission to a planet with conditions similar to those on Earth.* Part C (5-ESS1-2) **Performance Task:** Plaid Pete is On the Move! *In this task, students collect data, construct line graphs, and analyze patterns in natural phenomena to construct claims supported by evidence.* **Performance Task:** Spaceship Earth - Mystery 1 *In this task, students come to understand that the setting sun isn't moving, the Earth is spinning. In the activity, students use their bodies as a kinesthetic model of the Earth to understand how the speed of the Earth's spin affects the length of a day.* **Performance Task:** Spaceship Earth - Mystery 2 *In this task, students will learn why our ancestors divided the day into hours and how clocks measure the Sun's apparent movement. Students will make a shadow clock (sundial).* **Performance Task:** Spaceship Earth - Mystery 3 *In this task, students discover how the Sun's path changes with the seasons. The activity for this Mystery is part of the Exploration. It is a photo challenge, so you will not need supplies.* **Performance Task:** Spaceship Earth - Mystery 4 *In this task, students will be introduced to the Earth's orbital movement around the Sun, as a means of seeing why the constellations change.* **Performance Task:** Spaceship Earth - Mystery 5 *In this task, students explore why the Moon seems to change shape (phases) over the course of a month.* **Performance Task:** Spaceship Earth - Mystery 6 *In this task, students will learn what it means to see them with their own eyes, and will learn some interesting discoveries about each one.*

District/School Texts	District/School Supplementary Resources
Haddon Heights: ***Unit Kits for Science Labs and References*** **Barrington: N/A** **Lawnside: Science Fusion (Houghton Mifflin Harcourt - 2017)**	NEWSELA Mystery Science BrainPop Youtube Quizlet Kahoot Readworks

Merchantville: Exploring Science (National Geographic Learning)		PHET Simulations
Interdisciplinary Connections		
ELA RI.5.1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. RI.5.7: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. RI5.8: Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). RI.5.9: Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. W.5.1: Write opinion pieces on topics or texts, supporting a point of view with reasons and information. SL.5.5: Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.	**Math** MP.2: Reason abstractly and quantitatively. MP.4: Model with mathematics. 5.NBT.A.2: Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote power of 10. 5.G.A.2: Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.	**Social Studies**
21st Century Skills/Career Education CRP2. Apply appropriate academic and technical skills. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.	**Technology** 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 problem or issue.	

9.1.8.E.1 Explain what it means to be a responsible consumer and the factors to consider when making consumer decisions. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts. 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.		
Modifications and Accommodations		
Special Education Students Small group Direct instruction Restate/rephrase Graphic organizers Modified assignments Chunking Leveled text Intentional grouping Read text Extended time Breaks Teacher records/ student dictates	**English Language Learners** Labels Word banks Visuals Student friendly definitions Extended time Chunking Intentional grouping	**Students at Risk of School Failure** Leveled text Graphic organizers Modified assignments Kinesthetic activities Restate/rephrase Chunking Intentional grouping
Gifted and Talented Extension project Leveled text Leadership roles Intentional grouping Targeted learning from assessment	**Students with 504 Plans** Breaks Chunking Preferential seating Visual reminders Restate/rephrase Check-in/check-out system Visual time Teacher records/ student dictates	
Unit Duration: Instructional Days		
20 days		