Title: Earth & Sun **Grade: 5** **Length:** 30 Days		
Enduring Understandings: ● Earth is part of a planetary system in the universe. ● The orbits of Earth around the Sun and of the Moon around Earth, together with the rotation of Earth about its axis between its North and South poles, cause observable patterns ● The hydrosphere has properties that can be observed and quantified. ● The atmosphere has properties that can be observed and quantified. ● Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. ● Weather and climate on Earth are influenced by interactions of the Sun, the ocean, the atmosphere, ice, landforms, and living things. ● Earth's climate and human activities affect each other.	**Standards to be addressed: NGSS, CCSS ELA, CCSS Math** **NGSS:** **Earth Sciences** **5-ESS1 Earth's Place in the Universe** **5-ESS1-1.** Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from 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. **5-ESS2 Earth's Systems** **5-ESS2-1** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	

	5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. **5-ESS3-1 Earth and Human Activity** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. **Physical Sciences** **5-PS1-1**. **Matter and Its Interactions** Develop a model to describe that matter is made of particles too small to be seen **5-PS2-1 Motion and Stability.** Support an argument that the gravitational force exerted by Earth on objects is directed down. **Engineering, Technology, and Applications of Science** **3-5-ETS1 Engineering**	

	Design cost. **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. **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. <u>CCSS ELA:</u> RF 4: Read with sufficient accuracy and fluency to support comprehension. RI 1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences. RI 2: Determine main ideas of a text and explain how they are supported by key details; summarize the text. RI 3: Explain the relationships or interactions between two or more concepts in a scientific text based on specific information in the text. RI 4: Determine the meaning of general academic and domain-specific words and phrases in a text. RI 7: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a	

	question. RI 9: Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. RI 10: By the end of the year, read and comprehend informational science texts. W 5: Develop and strengthen writing. W 8: Recall relevant information from experiences or gather relevant information; take notes. W 9: Draw evidence from informational texts. SL 1: Engage in collaborative discussions. SL 2: Summarize information presented visually. L 4: Determine or clarify the meaning of words. L 5: Demonstrate understanding of word relationships. L 6: Acquire and use academic and domain-specific words and phrases. <u>CCSS Math:</u> MD 2: Represent and interpret data. OA 3: Analyze patterns and relationships.	
Essential Questions: **<u>Investigation 1: The Sun</u>** ● How and why does your shadow change during the day? ● What can be learned by studying the length and direction of shadows? ● What causes day and night? **<u>Investigation 2: Planetary Systems</u>** ● How can you explain why we see some natural objects only in the night sky, some only in the day sky, and some at both times? ● How would you describe the size of and distance between Earth, the Moon, and the Sun? ● How does the shape of the Moon change over 4 weeks?		

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- How do the parts of the solar system interact?
- Why do stars appear to move across the night sky?

<u>Investigation 3</u>: <u>Earth's Atmosphere</u>

- What is air?
- What is Earth's atmosphere?
- How do meteorologists measure and record weather variables?

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Disciplinary Core Ideas:

<u>Investigation 1: The Sun</u>

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 size and distance from Earth.

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

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Scientific & Engineering Practices:

<u>Investigation 1: The Sun</u>

- Asking questions
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations
- Obtaining, evaluating, and communicating information

<u>Investigation 2: Planetary Systems</u>

- Developing and using models
- Planning and carrying out investigations

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Crosscutting Concepts:

<u>Investigations 1 & 2:</u>

- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and system models

<u>Investigation 3</u>: <u>Earth's Atmosphere</u>

- Cause and effect
- Scale, proportion, and quantity
- Systems and system models

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include day and night; daily and seasonal changes in the length and direction of shadows; phases of the Moon; and different positions of the Sun, Moon, and stars at different times of the day, month, and year. **<u>Investigation 2: Planetary Systems</u>** The same as Investigation 1 plus: 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. **<u>Investigation 3</u>: <u>Earth's Atmosphere</u>** PS1.A: Structure and properties of matter ● 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	● Analyzing and interpreting data ● Using mathematics and computational thinking ● Constructing explanations ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information **<u>Investigation 3</u>: <u>Earth's Atmosphere</u>** ● Asking questions ● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking ● Constructing explanations ● Obtaining, evaluating, and communicating information		

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. ESS2.A: Earth materials and systems ● Earth's major systems are the geosphere, the hydrosphere, the atmosphere, and the biosphere. These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the			

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<td>atmosphere interact with the landforms to determine patterns of weather.
ESS2.C: The roles of water in Earth's surface processes
● Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.</td>
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<td colspan="3">Big Ideas-I want students to understand:

<u>Investigation 1: The Sun</u>
● Shadows are the dark areas that result when light is blocked.
● Shadows change during the day because the position of the Sun changes in the sky.
● The length and direction of a shadow depends on the Sun's position in the sky.
● Day is the half of Earth's surface being illuminated by sunlight; night is the half of Earth's surface in its own shadow.
● The cyclical change between day and night is the result of Earth's rotating around the stationary Sun.

<u>Investigation 2: Planetary Systems</u>
● The solar system includes the Sun and the objects that orbit it, including Earth, the Moon, seven other planets, their satellites, and smaller objects.
● Stars are at different distances from Earth.
● The Moon is much smaller than Earth and orbits at a distance equal to about 30 Earth diameters.</td>
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● The Sun is 12,000 Earth diameters away from Earth and is more than 100 times larger than Earth. ● The pulling force of gravity keeps the planets and other objects in orbit by continuously changing their direction of travel. ● A great deal of light travels through space to Earth from the Sun and from distant stars. **<u>Investigation 3</u>: <u>Earth's Atmosphere</u>** ● Air is a mixture of gases held by gravity near Earth's surface. ● Air has mass, takes up space, and is compressible. ● Most of Earth's air resides in the troposphere, the layer of the atmosphere closest to Earth's surface. ● Weather happens in the troposphere. ● Weather is the condition of Earth's atmosphere at a given time in a given place. ● Meteorology is the science of weather, and meteorologists are the scientists who study Earth's weather. ● Weather is described in terms of several variables.	
Do-I want students to be able to: **<u>Investigation 1: The Sun</u>** ● Observe and compare shadows during a school day. ● Relate the position of the Sun in the sky to the size and orientation of an object's shadow. ● Use physical models to explain day and night. ● Determine what causes day and night. **<u>Investigation 2: Planetary Systems</u>** ● Record graphically the organization of the solar system. ● Use models to reveal patterns and build cause-and-effect explanations. **<u>Investigation 3</u>: <u>Earth's Atmosphere</u>** ● Use models to investigate the properties of air. ● Describe the atmosphere using visual displays. ● Collect, organize, and interpret weather data.	
Know-What are the basics?:	

<u>Investigation 1: The Sun</u> Axis, compass, day, night, North Pole, North Star, orbit, orientation, revolution, rotation, shadow, Sun, sunrise, sunset **<u>Investigation 2: Planetary Systems</u>** Asteroid, asteroid belt, comet, constellation, crescent moon, dwarf planet, first-quarter Moon, force, full Moon, gas giant, planet, gibbous Moon, gravity, Kuiper belt, lunar cycle, Moon, night sky, new Moon, phase, planet, solar system, star, terrestrial planet, third-quarter Moon, waning Moon, waxing Moon **<u>Investigation 3: Earth's Atmosphere</u>** Air, air pressure, atmosphere, barometer, compress,forecast, humidity, hygrometer, mass, matter, meteorologist, precipitation, pressure, temperature, thermometer, troposphere, visibility, weather, weather variable, wind, wind direction, wind speed, wind vane	
How do I reinforce or build literacy or mathematics skills? <u>Literacy</u>: Reading skills supported through reading the science resources book: reading fluency, reading comprehension, determining main ideas, integrating information from multiple texts, drawing evidence from informational texts, determining the meaning of domain specific vocabulary. Writing skills supported through writing in the science notebooks: produce clear and coherent writing ,gather relevant information, recall relevant information from experiences, take notes, draw evidence from informational texts <u>Mathematics:</u> Creating tables and graphs Taking and using measurements Using critical and higher order thinking to solve problems	

Assessment: How will I know what students have learned?

Embedded Formative Assessments for all Investigations:

- Survey prior to starting module
- Science notebook entries
- Response sheets
- Performance Assessments
- Class discussions
- Reflections

Summative Assessments:

- I-Check after each investigation
- Post-test after all investigations are completed

Investigation 1: The Sun

Survey
Science Notebook Entry: Determine if they can explain how the position of the Sun in the sky changes throughout the day and how it affects shadows
Response Sheet: Sun Tracker activity
Science Notebook Entry: Determine if they can explain day & night
Investigation 1 I-Check

Investigation 2: Planetary Systems

Science Notebook Entry: Check observations of why we see some objects only in the night sky, some only in the day sky and some at both times.
Performance Assessment: Produce a scaled model of Moon and Earth
Science Notebook Entry: Students should be able to sequence the lunar cycle, identify the names of the Moon phases and associate Moon phases with the Moon's position
Response Sheet: Gravity
Science Notebook Entry: How do parts of the solar system interact
Investigation 2- I-Check

Investigation 3: Earth's Atmosphere

Performance Assessment: Students explore air in syringes while following science practices
Science Notebook Entry: Students show understanding of Earth's atmosphere.
Science Notebook entry: Check to see if students have adequate understanding of the variables that define weather and the

instruments and units used to acquire data related to those variables Investigation 3 I-Check	
What some ways we could possibly differentiate instruction to reach all learners? ● Graphic organizers ● Provide definitions for vocabulary ● Online activities ● Written directions ● Small group instruction ● Visual cues to assist with organizing science notebook ● Specific roles for group work ● Sentence starters for answering focus questions ● Shared slides and documents on Google	

Title: Living Systems	**Grade: 5**
Length: 30 days	
Enduring Understandings: ● Food provides animals with the materials they need for body repair and growth and is digested to release the energy they need to maintain body warmth and to move. ● Humans and other animals have systems made up of organs that are specialized for particular body functions. ● Organisms obtain gases, water, and minerals from the environment and release waste matter back into the environment. ● Matter cycles between air and soil, and among plants, animals, and microbes as these organisms live and die. ● Organisms are related in food webs. ● Some organisms, such as fungi and bacteria, break down dead organisms, operating as decomposers.	**Standards to be addressed: NGSS, CCSS ELA, CCSS Math** **NGSS:** **5-PS3-1 Energy** 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. **5-LS1-1 From Molecules to Organisms: Structures and Processes** Support an argument that plants get the materials they need for growth chiefly from air and water. **4-LS1-2 From Molecules to Organisms: Structures and Processes** 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. **5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. **5-ESS2-1 Earth's Systems** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **5-ESS3-1 Earth and Human Activity** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. **CCSS ELA:** RF 4: Read with sufficient accuracy and fluency to support comprehension. RI 1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences. RI 2: Determine main ideas of a text and explain how they are supported by key details; summarize the text. RI 3: Explain the relationships or interactions between two or more concepts in a scientific text based on specific information in the text. RI 4: Determine the meaning of general academic and domain-specific words and phrases in a text. RI 7: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question. RI 9: Integrate information from several

	texts on the same topic in order to write or speak about the subject knowledgeably. RI 10: By the end of the year, read and comprehend informational science texts. W 5: Develop and strengthen writing. W 8: Recall relevant information from experiences or gather relevant information; take notes. W 9: Draw evidence from informational texts. SL 1: Engage in collaborative discussions. SL 2: Summarize information presented visually. L 4: Determine or clarify the meaning of words. L 5: Demonstrate understanding of word relationships. L 6: Acquire and use academic and domain-specific words and phrases. **CCSS Math:** MD 2: Represent and interpret data. OA 3: Analyze patterns and relationships.

Essential Questions:
What provocative questions will foster inquiry, understanding, and transfer learning? What questions can you use to connect this unit to Cross-Cutting Concepts?

Investigation 1: Systems

- How can you identify a system?
- Is planet Earth a system?
- What organisms are both predators and prey in the kelp forest ecosystem?
- What happens when compost worms interact with organic litter?

Investigation 2: Nutrient Systems

- What does yeast need to break its dormancy?
- How do plants get the food they need?
- How do animals get the nutrients they need?

Investigation 3: Transport Systems

- How are nutrients transported to cells in a plant?
- How do humans transport nutrients to all their cells?
- Why do people breathe?

Disciplinary Core Ideas:	**Scientific & Engineering Practices:**	**Crosscutting Concepts:**
Investigations 1, 2, and 3: PS3.D: Energy in chemical	**Investigation 1: Systems**	**Investigation 1: Systems** ● Scale, proportion, and

processes and everyday life ● The energy released from food was once energy from the Sun that was captured by plants in the chemical processes that forms plant matter (from air and water). 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. 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	● Asking questions ● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Constructing explanations ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information **Investigation 2: Nutrient Systems** ● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking ● Constructing explanations ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information **Investigation 3: Transport Systems** ● Asking questions ● Developing and using models ● Planning and carrying out investigations	quantity ● Systems and system models ● Energy and matter ● Stability and change **Investigation 2: Nutrient Systems** ● Scale, proportion, and quantity ● Systems and system models ● Energy and matter **Investigation 3: Transport Systems** ● Patterns ● Scale, proportion, and quantity ● Systems and system models ● Energy and matter ● Structure and function

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. 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 environments, and release waste, matter (gas, liquid, or solid) back into the environments. ESS2.A: Earth materials and systems ● Earth's major systems are the geosphere, the hydrosphere, the atmosphere, and the biosphere. These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact	● Analyzing and interpreting data ● Using mathematics and computational thinking ● Constructing explanations ● Obtaining, evaluating, and communicating information	

with the landforms to determine patterns of weather.		

Big Ideas-I want students to understand:
What scientific explanations and/or models are critical for student understanding of the content?
So what? Who cares?
What is the most important for students to understand about this topic?

Investigation 1: Systems

- A system is a collection of interacting objects, ideas, and/or procedures that together define a physical entity or process.
- Earth can be described as the interaction of four earth systems: the rocky part (the geosphere), the atmosphere, the water (the hydrosphere), and the complexity of living organisms (the biosphere).
- Food webs are subsystems within ecosystems. They describe the transfer of matter and energy within the system.
- Food webs are made up of producers (organisms that make their own food), consumers (organisms that eat other organisms to obtain food), and decomposers (organisms that consume and recycle dead organisms and organic waste).

Investigation 2: Nutrient Systems

- Chlorophyll is the green pigment that absorbs sunlight in the cells of producer organisms.
- Green plant cells make sugar (nutrients) from carbon dioxide and water in the presence of sunlight, and release oxygen.
- A nutrient is a substance, such as sugar or starch, that is used by a cell to produce the energy needed to perform the functions of life.
- Plants make their own food by photosynthesis. Animals obtain nutrients by eating other organisms.
- Digestion is the process used by animals to break down complex food items into simple nutrients.

Investigation 3: Transport Systems

- All cells have basic needs: water, food, gas exchange, and waste disposal. Multicellular organisms have systems for transporting nutrients and wastes.
- Vascular plants have specialized tissues for the transport of water, minerals, and sugar to cells: xylem tubes carry water and minerals from the plant's roots to all the cells in a one-way flow; phloem tubes carry sugar from the leaves to all the cells that need it.
- In the human circulatory system, blood transports resources to the cells and wastes from the cells.

- In humans, the respiratory system transports oxygen to the blood and carbon dioxide from the blood.

Do-I want students to be able to:
What scientific practices will we explicitly focus on in this unit?
What key knowledge and skills will students develop as a result of this unit?
(Use verb phrases)

Investigation 1: Systems
- Analyze systems and subsystems.
- Make a worm habitat and observe it over time.

Investigation 2: Nutrient Systems
- Design and conduct experiments and analyze results.
- Use metric tools and make and record quantitative observations.

Investigation 3: Transport Systems
- Classify leaves based on venation patterns.
- Design and conduct experiments and analyze results.
- Use metric tools and make and record quantitative observations.

Know-What are the basics?:
What vocabulary formations or other facts do students need to know in order to understand the big ideas?

Investigation 1: Systems
Vocabulary: aquatic ecosystem, algae, atmosphere, bacteria, biosphere, carnivore, compost, consumer, decomposer, ecosystem, energy, food chain, food web, freshwater ecosystem, geosphere (lithosphere), herbivore, hydrosphere, interact, living, marine ecosystem, microorganism, nonliving, omnivore, phytoplankton, predator, prey, producer, recycle, redworm, terrestrial ecosystem, subsystem, system, zooplankton

Investigation 2: Nutrient Systems
Vocabulary: bloodstream, by-product, carbon dioxide, cell, chlorophyll, digestion, digestive system, dormancy, esophagus, fungus, large intestine, metabolism, nutrient, photosynthesis, small intestine, stomach, sugar, waste, yeast

Investigation 3: Transport Systems
Vocabulary: alveoli, artery, capillary, circulatory system, classify, diaphragm, heart, heart valve, leaf vein, left ventricle, lung, palmate, parallel, phloem, pinnate, respiratory system, right ventricle, sap, transpiration, vascular bundle, vascular system, vein, vital, capacity, xylem

How do I reinforce or build literacy or mathematics skills?

<u>Literacy:</u>
Reading skills supported through reading the science resources book: reading fluency, reading comprehension, determining main ideas, integrating information from multiple texts, drawing evidence from informational texts, determining the meaning of domain specific vocabulary.

Writing skills supported through writing in the science notebooks: produce clear and coherent writing ,gather relevant information, recall relevant information from experiences, take notes, draw evidence from informational texts

<u>Mathematics:</u>
Creating tables and graphs
Taking and using measurements
Using critical and higher order thinking to solve problems

Assessment: How will I know what students have learned?
<u>Performance Expectations:</u>
Does the formative or summative assessment require students to show their understanding in an observable way?
Does it make students' thinking visible?
Are there criteria and are the criteria relevant to the big ideas for the unit?

<u>Other evidence:</u>
Include multiple types of learning to give a more accurate picture of learning.

Embedded Formative Assessments for all Investigations:
- Survey prior to starting module
- Science notebook entries
- Response sheets
- Performance Assessments
- Class discussions
- Reflections

Summative Assessments:
- I-Check after each investigation
- Post-test after all investigations are completed

<u>Investigation 1: Systems</u>
- Part 1 - Science Notebook Check: Response to focus question (How can you identify a system?)
    - Students write that systems have interacting parts.

    - Students write that systems can be complex and may include subsystems.
- Part 2 - Science Notebook Check: Response to focus question (Is planet Earth a system?)
    - Students claim that Earth is a system.
    - Student cite two or more Earth subsystems as evidence (biosphere, atmosphere, geosphere, hydrosphere).
    - Students cite evidence that thousands of organisms are part of the Earth system.
    - Student cite evidence that food webs are subsystems that are part of ecosystems, which are part of the biosphere, which is part of the Earth system.
- Part 3 - Science Notebook Check: Response Sheet - Investigation 1
    - Students write that the arrows are drawn in the wrong direction; the arrows should point toward the organism doing the eating (the way the energy flows).
    - Students write that the Sun is usually assumed in a food web (producers need sunlight to make food), but the Sun is not usually drawn.
    - Students write that the decomposers (bacteria, fungi) are missing; lines should go from every organism to the decomposers.
- Part 4 - Performance Assessment Checklist
    - Students contribute to planning and conducting a well-reasoned investigation.
    - Students organize observations in some way.
    - Students can describe the part of the system they are creating in the worm habitat and how they might interact.
- Investigation 1 I-Check

<u>Investigation 2: Nutrient Systems</u>

- Part 1 - Science Notebook Check: Response to focus question (What does yeast need to break its dormancy?)
    - Students write that yeast needs water and sugar to get activated.
    - Students write that sugar is an energy nutrient for yeast cells; carbon dioxide is evidence of yeast activity.
- Part 2 - Science Notebook Check: Response to focus question (How do plants get the food they need?)
    - Students write that plant cells get their energy nutrients from food produced by the cells containing chlorophyll.
    - Students write that plant cells in sprouting seeds get energy nutrients from food (starch) stored in the seed.
- Part 3 - Science Notebook Check: Response Sheet - Investigation 2
    - Students disagree with the prompt student's statement and model.
    - Students write that digestion is the process that breaks food down into nutrient chemicals, which are delivered to cells, providing for their needs.
- Investigation 2 I-Check

Investigation 3: Transportation Systems

- Part 1 - Science Notebook Check: Response to focus question (How are nutrients transported to cells in a plant?)
    - Students write that plants have two kids of vascular tissue for transporting cell nutrients: xylem and phloem.
    - Students write that xylem vessels (tubes) carry water and minerals up from the roots during the transpiration process.
    - Students write that phloem vessels (tubes) carry sap, a sugar-rich solution, from cells that produce food (sugar) to all the other cells that need it.
- Part 2 - Science Notebook Check: Response Sheet - Investigation 3
    - Students write that both use tubes and liquids to transport nutrients and waste to all parts of the organism.
    - Students write that both carry nutrients to individual cells to support life; waste products are carried away from the cells.
    - Students write that both carry nutrients to individual cells to support life; waste products are carried away from the cells. Phloem tubes carry food (sugar or sap) to all cells in the plants so they can carry on the processes of life.
    - Students write that the human circulatory system has one set of tubes that serves both functions that the plant xylem and phloem do. Blood circulates from the heart to the lungs, back to the heart, and then to other parts of the body so that on the route from and back to the heart, nutrients are delivered to the cells and waste is carried away.
- Part 3 - Performance Assessment Checklist
    - Students obtain information from the reading and the video and can discuss what they learned about the respiratory system.
    - Students conduct the investigation following logical procedures, and recording and organizing their observations.
    - Students contribute data to the class graph and can interpret the results.
    - Students can explain the function of the respiratory system and support their explanations with evidence.
- Investigation 3 I-Check

What some ways we could possibly differentiate instruction to reach all learners?
How shall we teach for understanding?
Incorporate different learning styles as well hands-on and engaging activities?

- Graphic organizers
- Provide definitions for vocabulary
- Online activities
- Written directions
- Small group instruction

- Visual cues to assist with organizing science notebook
- Specific roles for group work
- Sentence starters for answering focus questions
- Shared slides and documents on Google

Title: Mixtures & Solutions **Grade: 5**

Length: 30 days

Enduring Understandings:

- Solid matter can break into pieces too small to see.
- Mass is conserved (not created or lost) during changes.
- Properties can be used to identify substances (e.g. solubility).
- Relative density can be used to seriate solutions of different concentrations.
- A mixture is two or more intermingled substances.
- Dissolving occurs when one substance disappears in a second substance.

Standards to be addressed: NGSS, CCSS ELA, CCSS Math

NGSS:

5-PS1 Matter and Its Interactions

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

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

3-5-ETS1 Engineering Design

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-ETS1-2. 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. 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. **CCSS ELA:** RF 4: Read with sufficient accuracy and fluency to support comprehension. RI 1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences. RI 2: Determine main ideas of a text and explain how they are supported by key details; summarize the text. RI 4: Determine the meaning of general academic and domain-specific words and phrases in a text. RI 7: Draw on information from multiple print or digital sources to locate an answer to a question quickly. RI 8: Explain how an author uses reasons and evidence to support particular points in a text. RI 9: Integrate information from several texts on the same topic in order to write or speak about the subject. W 4: Produce clear and coherent writing. W 8: Recall relevant information from experiences or gather relevant information; take notes. W 9: Draw evidence from informational texts. SL 1: Engage in collaborative discussions. SL 2: Summarize a written text read aloud or information presented in diverse media. L 4: Determine or clarify the meaning of words. L 6: Acquire and use academic and domain-specific words. **CCSS Math:** MD 2: Represent and interpret data. MD 3: Understand concepts of volume.

Essential Questions: *What provocative questions will foster inquiry, understanding, and transfer learning? What questions can you use to connect this unit to Cross-Cutting Concepts?* **<u>Investigation 1: Separating Mixtures</u>** ● How can a mixture by separated? ● Where does the solid material go when a solution is made? ● How can you separate a mixture of dry materials? ● Are there materials outdoors that will dissolve in water? **<u>Investigation 2: Developing Models</u>** ● What is the process to develop a model of the black box? ● How does a drought-stopper system work? ● What is the difference between dissolving and melting? **<u>Investigation 3: Concentration</u>** ● Are all solutions made with soft-drink powder and water the same? ● How can you determine which salt solution is more concentrated? ● How can you determine the relative concentrations of three mystery solutions? ● What is the relationship between salt-solution concentration and density?	

Disciplinary Core Ideas:	**Scientific & Engineering Practices:**	**Crosscutting Concepts:**
<u>Investigations 1, 2, and 3:</u> PS1.A: Structure and properties of matter ● 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	**<u>Investigation 1: Separating Mixtures</u>** ● Defining problems ● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking ● Designing solutions ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information	**<u>Investigation 1: Separating Mixtures</u>** ● Cause and effect ● Scale, proportion, and quantity ● Systems and system models **<u>Investigation 2: Developing Models</u>** ● Cause and effect ● Systems and system models ● Energy and matter **<u>Investigation 3: Concentration</u>** ● Cause and effect

the inflation and shape of a balloon and the effects of air on larger particles or objects. ● The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. ETS1.A: Defining and delimiting 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. ETS1.B: Developing possible solutions ● At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. ETS1.C: Optimizing the design solution ● Different solutions need to be tested in order to determine which of	**<u>Investigation 2: Developing Models</u>** ● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Constructing explanations ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information **<u>Investigation 3: Concentration</u>** ● Developing and using models Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking Constructing explanations ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information	● Scale, proportion, and quantity ● Systems and system models ● Energy and matter

them best solves the problem, given the criteria and the constraints.		

Big Ideas-I want students to understand:
What scientific explanations and/or models are critical for student understanding of the content?
So what? Who cares?
What is the most important for students to understand about this topic?

<u>Investigation 1: Separating Mixture</u>

- A mixture is two or more materials intermingled.
- An aqueous solution is a mixture in which a substance disappears (dissolves) in water to make a clear liquid.
- Mixtures can be separated into their constituents.
- The mass of a mixture is equal to the mass of its constituents.

<u>Investigation 2: Developing Models</u>

- Models are explanations of objects, events, or systems that cannot be observed directly.
- Models are representations used for communicating and testing.
- Developing a model is an iterative process, which may involve observing, constructing, analyzing, and revising.
- Dissolving is an interaction between two (or more) substances: a solute, which dissolves, and a solvent, which does the dissolving and into which the solute disappears.
- Melting is a change in a single substance from solid to liquid caused by heat (energy transfer).
- The amount of matter is conserved when it changes form.

<u>Investigation 3: Concentration</u>

- Concentration is the amount of dissolved solid material per unit volume of water.
- Solutions with a lot of solid dissolved in a volume of water are concentrated; solutions with little solid dissolved in a volume of water are dilute.
- A concentrated solution can be diluted by adding water; dilute solution can be concentrated by adding more solid.
- When equal volumes of two salt solutions are weighed, the heavier one is the more concentrated solution.
- Density is mass per unit volume.
- More concentrated salt solutions have greater density.
- Less dense solutions form layers on more dense solutions.

Do-I want students to be able to:
What scientific practices will we explicitly focus on in this unit?
What key knowledge and skills will students develop as a result of this unit?
(Use verb phrases)

Investigation 1: Separating Mixtures

- Make mixtures and solutions with different solid materials and water.
- Separate mixtures and solutions, using screens, filters, and evaporation.
- Measure solids and liquids to compare the mass of a mixture to the mass of its parts.
- Compare proposals for design solutions on the basis of how well each one meets the criteria for success and how well each takes the constraints into account.

Investigation 2: Developing Models

- Work with others as scientists to create conceptual and physical models that explain how something works.
- Gather data, and use analysis and logic to construct and communicate reasonable explanations for how a system functions.

Investigation 3: Concentration

- Use a balance to determine relative concentration.
- Layer solutions to determine relative density (concentration).

Know-What are the basics?:
What vocabulary formations or other facts do students need to know in order to understand the big ideas?

Investigation 1: Separating Mixtures
Vocabulary: constraint, criteria, crystal, diatomaceous earth, dissolve, engineer, evaporation, extract, filter, gravel, magnet, mass, mixture, powder, property, salt, screen, separate, solute, solution, solvent, transparent

Investigation 2: Developing Models
Vocabulary: analyze, collaboration, condensation, consensus, construct, freezing, melting, model, phase change, revise, siphon, water vapor

Investigation 3: Concentration
Vocabulary: concentrated, concentration, density, dilute, equal volumes, layer, less dense, more dense

How do I reinforce or build literacy or mathematics skills?

Literacy:

Reading skills supported through reading the science resources book: reading fluency, reading comprehension, determining main ideas, integrating information from multiple texts, drawing evidence from informational texts, determining the meaning of domain specific vocabulary.

Writing skills supported through writing in the science notebooks: produce clear and coherent writing ,gather relevant information, recall relevant information from experiences, take notes, draw evidence from informational texts

Mathematics:
Creating tables and graphs
Using metric measurements
Using critical and higher order thinking to solve problems

Assessment: How will I know what students have learned?
Performance Expectations:
Does the formative or summative assessment require students to show their understanding in an observable way?
Does it make students' thinking visible?
Are there criteria and are the criteria relevant to the big ideas for the unit?

Other evidence:
Include multiple types of learning to give a more accurate picture of learning.

Embedded Formative Assessments for all Investigations:
- Survey prior to starting module
- Science notebook entries
- Response sheets
- Performance Assessments
- Class discussions
- Reflections

Summative Assessments:
- I-Check after each investigation
- Post-test after all investigations are completed

Investigation 1: Separating Mixtures
- Part 1 - Science Notebook Check: Response to focus question (How can a mixture be separated?)
    - Students define mixture, dissolve, and solution.
    - Students know that solutions are composed of a solvent (liquid) and a solute (solid) that is dissolved in the solvent.
    - Students know that mixtures can be separated back into the original materials, using screens and filters.

- Part 2 - Science Notebook Check: Response Sheet - Investigation 1
    - Students may choose either graph, but they must justify their choice based on how it demonstrates conservation of mass.
- Part 3 - Performance Assessment Checklist
    - Students come up with a design plan.
    - Students have a logical plan for separating the mixtures.
    - Students from two groups compare their solutions and evaluate the process designed by the other group and provide feedback.
    - Students can explain that the tool used to separate the various ingredients is determined by particle size and magnetic properties.
- Investigation 1 I-Check

Investigation 2: Developing Models

- Part 1 - Science Notebook Check: Response to focus question (What is the process to develop a model of the black box?)
    - Students write something about each of the four processes in the description of how they developed their models: observing, constructing, analyzing, and revising.
- Part 2 - Performance Assessment Checklist
    - Students develop a plausible model that explains how the drought stopper works.
    - Students are engaged in rerunning the drought stopper to gather more observational data.
    - Students can back up their arguments about how the drought stopper works with observational data and logical reasoning.
- Part 3 - Response Sheet - Investigation 2
    - Students circle that balance is level.
    - Students explain that even though the volume changes (gets smaller) as ice melts, the mass remains the same.
- Investigation 2 I-Check

Investigation 3: Concentration

- Part 1 - Science Notebook Check: Answer to focus question (Are all solutions made with soft-drink powder and water the same?)
    - Students write that the solutions differ in concentration. Concentration is the amount of solid material dissolved in a unit of water.
    - Students write about and draw a model that indicates that concentrated solutions include a lot of solid dissolved in a given volume of water; dilute solutions include less solid dissolved in the equivalent volume of water.
- Part 2 - Response Sheet - Investigation 3
    - (a) Students write that to compare mathematically, you need to use equivalent numbers.
    - (b) Students draw a model that indicates a way to compare the three solutions. (All three solutions are the same concentration.)

    - (c) Students write that you can use a balance when the solutions are made of the same materials and you compare equal volumes.
- Part 3 - Performance Assessment Checklist
    - Students are engaged and contributing to planning and conducting a well-reasoned investigation.
    - Students organize their observations (data) in some way for easy analysis and interpretation.
    - Students can present an argument using evidence for which mystery solution is the most concentrated.
- Part 4 - Science Notebook Check: Answer to focus question (What is the relationship between salt-solution concentration and density?)
    - Students explain that each solution has a different density and that less dense solutions float on more dense solutions.
    - Students indicate a relationship between concentration and density. The greater the concentration of a salt solution, the greater is its density. Concentrated salt solutions are more dense than dilute salt solutions.
- Investigation 3 I-Check

What some ways we could possibly differentiate instruction to reach all learners?
How shall we teach for understanding?
Incorporate different learning styles as well hands-on and engaging activities?

- Graphic organizers
- Provide definitions for vocabulary
- Online activities
- Written directions
- Small group instruction
- Visual cues to assist with organizing science notebook
- Specific roles for group work
- Sentence starters for answering focus questions
- Shared slides and documents on Google