Fifth Grade Performance Targets

for the
South Carolina College- and Career-Ready Science Standards 2021

For use 2025-2026

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Contents

Purpose and Use

Science is a way of understanding the physical universe using observation and experimentation to explain natural phenomena. Science also refers to an organized body of knowledge that includes core ideas to the disciplines and common themes that bridge the disciplines. As science educators we must take a 3-dimensional approach in facilitating student learning. By addressing content, science and engineering practices and crosscutting concepts, students can have relevant and evidence-based instruction that can help solve current and future problems.

This document is intended as a guide for discerning and describing features of students and their work who have met the stated Performance Expectation (PE). This document is not intended to be read from cover to cover, but to be used, when needed, to support teacher professional learning and curriculum decisions. This is not intended for student use, and thus is not written in student-friendly language. This is not a curriculum or a means to limit instruction in the classroom. Although each PE states a dedicated Science and Engineering Practice (SEP) and Crosscutting Concept (CCC), students will need to use the whole range of SEPs and CCCs to achieve success by the end of instruction.

Three-dimensional science learning requires discipline specific communication skills. This means that effective science learning occurs when students are expected to speak, listen, read, and write in ways that are appropriate to science. With each Performance Target, there are question/sentence stems and terminology to support student discourse about phenomena to help teachers facilitate the acquisition of science discourse. Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding. The terms and stems in this section are intended to provide a baseline for teachers, neither list is exhaustive nor complete.

In addition to the doing (SEP), thinking (CCC), and learning of science knowledge (Disciplinary Core Ideas) outlined here, students will also require a working knowledge of grade-level appropriate tools and techniques of science. Students should know and recognize how scientists and engineers use these tools and techniques, not just identify them. Students should be able to use these tools to gather data, describe how these tools gather data, and/or interpret data sampled from them. These tools and techniques for Grade 5 include all those previously identified and add or emphasize:

- balance
- binoculars
- hand lens
- hot plate
- light source
- microscope
- spring scale
- telescope

Document Updates

August 2025

- All Performance Expectation statements have been reformatted to call out each of the dimensions as follows:
    - Science and Engineering Practice – **bold**
    - Crosscutting Concept – *italicize*
    - Disciplinary Core Idea – regular
- The watermark from previous versions of this resource has been replaced with the wording “For use 2025-2026” on the title page and in the footer. This change was made to improve accessibility of this resource.
- Adjusted formatting and grammar

June 2024

- Updated watermark to 2024-2025.
- Adjusted formatting and grammar.

PS1 – Matter and Its Interactions

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

Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, dissolving and evaporating salt water, and effects of air particles on larger objects such as leaves.

State Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Developing and Using Models Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model to describe phenomena.	**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 (and can be detected by their impact on other objects) can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.	**Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large.

Observable features of student performance by the end of the course:

1. **Components of the model**
    a. Students develop/use a model to identify and describe the relevant components, including:
        i. bulk matter (macroscopic observable matter; for example: as sugar, air, water, etc.) and
        ii. particles of matter (for example: atoms) that are too small to be visible.

2. **Relationships**
    a. Students develop/use a model to represent and describe relationships between the components, including:
        i. bulk matter and tiny particles that cannot be visible (for example: tiny particles of matter that cannot be visible make up bulk matter, etc.), and
        ii. the behavior of a collection of many tiny particles of matter and observable phenomena involving bulk matter (for example: an expanding balloon, evaporating liquids, substances that dissolve in a solvent, effects of wind, etc.).
3. **Connections**
    a. Students develop/use a model to describe how matter composed of tiny particles too small to be visible can account for observable phenomena (for example: air inflating a basketball, ice melting into water, etc.).

5-PS1-1 Academic Language

Question/Sentence Stems

- The scale of the model of ______ is [smaller/larger/the same] compared to the actual objects.
- I/We need to use a scaled model because ______.
- My/Our model relates to the phenomenon because ______.

Terminology to Support Student Discourse about Phenomena

*Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding.

- matter
- particles
- substance

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* [sic] of matter* is conserved.

> ***Clarification Statement:*** Examples of reactions or changes could include phase changes over time, dissolving, mixing that form new substance, and weighing* [sic] substances before and after changes.
>
> ***State Assessment Boundary:*** Assessment does not include distinguishing mass and weight.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Using Mathematics and Computational Thinking Mathematical and computational thinking in 3-5 builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. Measure and graph quantities such as weight to address scientific and engineering questions and problems.	**PS1.A: Structure and Properties of Matter** The amount (weight) [sic] of matter is conserved when it changes form, even in transitions in which it seems to vanish. **PS1.B: Chemical Reactions** No matter what reaction or change in properties occurs, the total weight [sic] of the substances does not change. **ETS2.A: Interdependence of Science, Engineering, and Technology** Tools and instruments (e.g., scales, thermometers, graduated cylinders) are used in scientific exploration to gather data and help answer questions about the natural world.	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

*Mass is the more appropriate measurement of the amount of matter in an object. Weight is a measurement of the gravitational force acting on an object's matter. Although distinguishing between the two measurements is beyond the State Assessment boundary for this PE, the following performance target will use the terms appropriately. The underlying scientific concept here is the Law of Conservation of Matter (The Law of Conservation of Mass).

Observable features of student performance by the end of the course:

1. **Representation**
   a. Students measure and graph quantities using appropriate unites (limited to grams [g], kilograms [kg]), including:
      i. mass of substances before they are heated, cooled, or mixed, and
      ii. mass of substances, including any new substances produced by a reaction, after they are heated, cooled, or mixed.
2. **Mathematical/computational analysis**
   a. Students measure and/or calculate the difference between the total mass of the substances (using standard units) before and after they are heated, cooled, and/or mixed.
   b. Students describe the changes in properties they observe during and/or after heating, cooling, or mixing substances.
   c. Students use their measurements and calculations to describe that the total weights of the substances did not change, regardless of the reaction or changes in properties that were observed.
   d. Students use measurements and descriptions of weight, as well as the assumption of consistent patterns in natural systems, to address scientific questions through evidence about the conservation of the amount of matter, including the idea that the total weight of matter is conserved after heating, cooling, or mixing substances.

5-PS1-2 Academic Language

Question/Sentence Stems

- A quantity of ______ and ______ can be compared.
- I/We can observe (notice) the pattern of ______ presented in the data collected.
- The observed pattern supports the conclusion that ______ is caused by ______, because ______.
- The following mathematical representation could help me to identify patterns in ______ data.

Terminology to Support Student Discourse about Phenomena

*Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding.

- chemical change
- dissolving
- matter
- particles
- phase change
- physical change
- properties
- quantities
- reaction
- substance
- temperature
- weight

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, and reflectivity; density is not intended as an identifiable property.

State Assessment Boundary: Assessment does not include density or distinguishing mass and weight.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.	**PS1.A: Structure and Properties of Matter** 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. **ETS2.A: Interdependence of Science, Engineering, and Technology** Tools and instruments (e.g., scales, thermometers, graduated cylinders) are used in scientific exploration to gather data and help answer questions about the natural world.	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

*Density is the primary property used to distinguish materials by property. Although using density conflicts with the State Assessment Boundary, exposure to this property in the classroom can only enhance students' ability to use properties to identify materials.

Observable features of student performance by the end of the course:

1. **Identifying the phenomenon under investigation**
    a. Students identify the purpose of the investigation, to collect data about the idea that materials can be identified based on their observable and measurable properties.
2. **Identifying the evidence to address the purpose of the investigation**
    a. Students describe the data (for example: qualitative observations and quantitative measurements) to be collected and the evidence to be derived, including:
        i. properties of materials that can be used to identify those materials (for example: color, density, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, solubility, etc.).
3. **Planning the investigation**
    a. Students describe how the data will be collected, including:
        i. quantitative measures of properties, in appropriate units (limited to grams, kilograms, milliliters, liters, density),
        ii. observations of properties such as color, conductivity, and reflectivity, and
        iii. determination of conductors vs. nonconductors and magnetic vs. nonmagnetic materials.
4. **Collecting the data**
    a. Students collect and record data.

5-PS1-3 Academic Language

Question/Sentence Stems

- The quantity of ______ and ______ can be compared.
- What is the proportion of ______ that are ______?
- To understand the phenomenon of ______, I/We can use a scale of ______ in our model.
- In order to conclude that ______ caused ______, the following evidence is needed ______.

Terminology to Support Student Discourse about Phenomena

*Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding.

- conductivity
- hardness
- magnetic forces
- matter
- particles
- properties
- solubility
- substance

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

State Assessment Boundary: Mass and weight are not distinguished.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. 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.	**PS1.B: Chemical Reactions** When two or more different substances are mixed, a new substance with different properties may be formed.	**Cause and Effect** Cause-and-effect relationships are routinely identified, tested, and used to explain change.

Observable features of student performance by the end of the course:

1. **Identifying the phenomenon under investigation**
    a. Students identify the purpose of the investigation, to provide evidence for whether new substances are formed by mixing two or more substances, based on the properties of the resulting substance.
2. **Identifying the evidence to address the purpose of the investigation**
    a. Students describe the data to be collected and the evidence to be derived, including:
        i. quantitative (for example: mass) and qualitative properties (for example: state of matter, color, texture, odor, etc.) of the substances to be mixed, and
        ii. quantitative and qualitative properties of the resulting substances.
3. **Planning the investigation**
    a. Students describe how the data will be collected, including:
        i. how quantitative and qualitative properties of the two or more substances to be mixed will be determined and measured,

ii. how quantitative and qualitative properties of the substances that resulted from the mixture of the two or more substances will be determined and measured,
iii. number of trials for the investigation, and
iv. how variables will be controlled to ensure a controlled scientific investigation (for example: the temperature at which the substances are mixed, the number of substances mixed together in each trial).

4. **Collecting the data**
   a. Students collect and record data, including data about the substances before and after mixing.

5-PS1-4 Academic Language

Question/Sentence Stems

- When I/we change ______ in the system, ______ is affected.
- If ______ happens, I/we predict that ______ will occur.
- The evidence presented in the scenario supports the claim that ______ causes ________.

Terminology to Support Student Discourse about Phenomena

*Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding.

- chemical change
- chemical property
- particle
- physical change
- physical property
- substance

PS2 – Motion and Stability: Forces and Interactions

5-PS2-1. Support an argument that the gravitational force *exerted by Earth on objects* is directed down.

> ***Clarification Statement:*** "Down" is a local description of the direction that points toward the center of the spherical Earth.
>
> ***State Assessment Boundary:*** Assessment does not include mathematical representation of gravitational force.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Engaging in Argument from Evidence Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Support an argument with evidence, data, or a model.	**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.	**Cause and Effect** Cause-and-effect relationships are routinely identified and used to explain change.

Observable features of student performance by the end of the course:

1. **Supported claims**
    a. Students make, support, ore refute a claim that the gravitational force exerted by Earth on objects is directed down toward the center of Earth.
2. **Identifying scientific evidence**
    a. Students identify and describe the given evidence, data, and/or models that support or refute a claim, including:
        i. multiple lines of evidence that indicate that the Earth's shape is spherical (for example: observation of ships sailing beyond the horizon, the shape of the Earth's shadow on the Moon during an eclipse, the changing height of the North Star above the horizon as people travel north and south, etc.);
        ii. that objects dropped appear to fall straight down; and
        iii. that people live all around the spherical Earth, and they all observe that objects appear to fall straight down.

3. **Evaluation and critique**
    a. Students evaluate and identify the strengths and weakness of the evidence to determine whether it is sufficient and relevant to supporting the claim.
4. **Reasoning and synthesis**
    a. Students use the following chain of reasoning to connect evidence:
        i. If Earth is spherical, and all observers see objects near them falling directly “down” to the Earth’s surface, then all observers would agree that objects fall toward the Earth’s center.
        ii. Since an object that is initially stationary when held moves downward when it is released, there must be a force (gravity) acting on the object that pulls the object toward the center of Earth.

5-PS2-1 Academic Language

Question/Sentence Stems

- A possible cause of what I/we observed is ______. I/We know this because ______.
- If ______ happens, I/we predict that ____ will occur.
- When I/we change _____, _____ is affected.
- My/Our claim is _____. My/Our evidence from the investigation is ______.

Terminology to Support Student Discourse about Phenomena

*Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding.

- cause
- claim
- downward
- effect
- evidence
- exert
- force
- gravitational force
- gravity
- spherical

PS3 – Energy

5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) *was once energy from the sun*.

> ***Clarification Statement:*** Examples of models could include food webs or diagrams and flowcharts to illustrate the flow of energy.
>
> ***State Assessment Boundary:*** Assessment does not include cellular mechanisms of digestive absorption.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Developing and Using Models Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Use models to describe phenomena.	**PS3.D: Energy in Chemical Processes and Everyday Life** The energy released [from] food was once energy from the Sun that was captured by plants in the chemical process that forms plant matter (from air and water). **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*)	**Energy and Matter** Energy can be transferred in various ways and between objects.

Observable features of student performance by the end of the course:

1. **Components of the model**
    a. Students develop/use a model to identify and describe the relevant components, including:
        i. energy,
        ii. the Sun,
        iii. animals, including their bodily functions (for example: body repair, growth, motion, body warmth maintenance, etc.), and
        iv. plants.

2. **Relationships**
    a. Students develop/use a model to identify and describe the relevant relationships between components, including:
        i. the relationship between plants and the energy they get from sunlight to produce food;
        ii. the relationship between food and the energy and materials that animals require for bodily functions (for example: body repair, growth, motion, body warmth maintenance, etc.); and
        iii. the relationship between animals and the food they eat, which is either other animals or plants (or both), to obtain energy for bodily functions and materials for growth and repair.
3. **Connections**
    a. Students develop/use a model to describe the relationships between energy from the Sun and animals' needs for energy, including:
        i. Since all food can eventually be traced back to plants, all the energy that animals use for body repair, growth, motion, and body warmth maintenance is energy that once came from the Sun.
        ii. Energy from the Sun is transferred to animals through a chain of events that begins with plants producing food then being eaten by animals.

5-PS3-1 Academic Language

Question/Sentence Stems

- The flow of energy causes ______ to occur in the system.
- The cycling of matter affects the system by ______.
- The matter in the system enters from ______.
- The energy is entering the system by ______.
- The energy is leaving the system by ______.

Terminology to Support Student Discourse about Phenomena

*Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding.

- energy
- growth
- heat
- maintain
- matter
- model
- motion
- movement
- repair
- transfer

LS1 – From Molecules to Organisms: Structures and Processes

5-LS1-1. Support an argument with evidence that plants obtain *materials they need* for growth mainly from air and water.

> ***Clarification Statement:*** Without inputs of energy (Sunlight) and matter (carbon dioxide and water), a plant cannot grow. Evidence could be drawn from diagrams, models, and data that are gathered from investigations.
>
> ***State Assessment Boundary:*** Assessment does not include molecular explanations of photosynthesis.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Engaging in Argument from Evidence Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Support an argument with evidence, data, or a model.	**LS1.C: Organization for Matter and Energy Flow in Organisms** Plants acquire their material for growth chiefly from air and water.	**Energy and Matter** Matter is transported into, out of, and within systems.

Observable features of student performance by the end of the course:

1. **Supported claims**
    a. Students make, support, or refute a claim that plants acquire the materials they need for growth chiefly from air and water.

2. **Identifying scientific evidence**
    a. Students describe the evidence, data, and/or models that support or refute a claim, including:
        i. plant growth over time,
        ii. changes in the mass of soil and water within a closed system with a plant, indicating:
            1. soil does not provide most of the material necessary for plant growth (for example: changes in mass of soil and a plant in a pot over time, hydroponic growth of plants, etc.), and
            2. plants' inability to grow without water,
        iii. plants' inability to grow without air, and
        iv. air is matter (for example: empty object vs. air filled object).
3. **Evaluating and critiquing evidence**
    a. Students evaluate and identify the strengths and weaknesses of the evidence, including:
        i. whether a particular material (for example: air, soil, etc.) is required for growth of plants and
        ii. whether a particular material (for example: air, soil, etc.) may provide sufficient matter to account for an observed increase in mass of a plant during growth.
4. **Reasoning and synthesis**
    a. Students use the following chain of reasoning to connect the evidence:
        i. During plant growth in soil, the mass of the soil changes very little over time, whereas the mass of the plant changes significantly. Additionally, some plants can be grown without soil at all.
        ii. Because some plants don't need soil to grow, and others show increases in plant matter—as measured by mass—but not accompanying decreases in soil matter, the material from soil must not enter the plant in sufficient quantities to be the chief contributor to plant growth.
        iii. Plants require soil and other material for growth.
        iv. A plant cannot grow without water or air. Because both air and water are matter and are transported into the plant system, they can provide the materials plants need for growth.
        v. Since soil alone accounts for the change in weight as a plant grows and since plants take in water and air, both of which could contribute to the increase in mass during plant growth, plant growth must come chiefly from water and air.

5-LS1-1 Academic Language

Question/Sentence Stems

- The flow of energy causes ______ to occur in the system.
- In the system, the cycling of matter ______.
- The matter in the system enters from ______.
- The energy is entering the system by ______.
- The energy is leaving the system by ______.
- My/Our claim is ______. My/Our evidence from the investigation is ______.

Terminology to Support Student Discourse about Phenomena

*Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding.

- air
- claim
- convert
- energy
- evidence
- growth
- photosynthesis
- plant matter
- water

LS2 – Ecosystems: Interactions, Energy, and Dynamics

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

> ***Clarification Statement:*** Emphasis is on the idea that matter that is not food (such as air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.
>
> ***State Assessment Boundary:*** Assessment does not include molecular explanations.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Developing and Using Models Modeling in 3-5 builds on K-2 models and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model to describe phenomena.	**LS2.A: Interdependent Relationships in Ecosystems** The food of almost any kind of animal can be traced back to plants (producers). Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants (either way they are consumers). 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. **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.	**Systems and System Models** A system can be described in terms of its components and their interactions.

Observable features of student performance by the end of the course:

1. **Components of the model**
    a. Students develop/use a model and describe the relevant components, including:
        i. matter,
        ii. plants,
        iii. animals,
        iv. decomposers (for example: bacteria, fungi), and
        v. environment.
2. **Relationships**
    a. Students develop/use a model to represent and describe the relationships among relevant components, including:
        i. The relationships in the system between organisms that consume other organisms, including:
            1. animals that consume other animals,
            2. animals that consume plants,
            3. organisms that consume dead plants and animals, and
            4. the movement of matter between organisms during consumption.
    b. The relationship between organisms and the exchange of matter from and back into the environment (for example: organisms obtain matter from their environments for life processes and release waste back into the environment, decomposers break down plant and animal remains to recycle some materials back into the soil, etc.).
3. **Connections**
    a. Students develop/use a model to describe:
        i. The cycling of matter in the system between plants, animals, decomposers, and the environment.
        ii. How interactions in the system of plants, animals, decomposers, and the environment allow multiple species to meet their needs.
        iii. That newly introduced species can affect the balance of interactions in a system (for example: a new animal that has no predators consumes much of another organism's food within the ecosystem, etc.).
        iv. That changing an aspect (for example: organisms or environment) of the ecosystem will affect other aspects of the ecosystem.

5-LS2-1 Academic Language

Question/Sentence Stems

- In the model of this system, the cycling of matter ______.
- In the model of this system, the cycling of energy ______.
- The key components of the system are ______.
- In the system, ______ and ______ interact in ______ way.

Terminology to Support Student Discourse about Phenomena

*Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding.

- air
- animals
- bacteria
- decomposer
- Earth
- ecosystems
- environment
- interact
- matter
- organism
- plants
- system
- water

ESS1 – Earth's Place in the Universe

5-ESS1-1. Support an argument with evidence that the apparent brightness of the sun compared to other stars is due to *their relative distances* from Earth.

Clarification Statement: Evidence could be drawn from various media, diagrams, models, or data that are gathered from investigations.

State Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness such as stellar masses, age, and stage.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Engaging in Argument from Evidence Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Support an argument with evidence, data, or a model.	**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.	**Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large.

Observable features of student performance by the end of the course:

1. **Supported claims**
   a. Students make, support, or refute a claim that the apparent brightness of the Sun and stars is due to their relative distances from Earth.
2. **Identifying scientific evidence**
   a. Students describe the evidence, data, and/or models to support or refute a claim, including:
      i. The Sun and other stars are natural bodies in the sky that give off their own light.
      ii. The apparent brightness of a variety of stars, including the Sun.
      iii. A luminous object close to a person appears much brighter than a similar object that is very far away from a person (for example: nearby streetlights appear brighter than distant streetlights, etc.).
      iv. The relative distance of the Sun and stars from Earth (for example: although the Sun and other stars are all far from the Earth, the stars are very much farther away; the Sun is much closer to Earth than other stars, etc.).

3. **Evaluating and critiquing evidence**
    a. Students evaluate and identify the strengths and weaknesses of the evidence to determine its relevance to supporting the claim, and sufficiency to describe the relationship between apparent size and apparent brightness of the Sun and other stars and their relative distances from Earth.
    b. Students determine whether additional evidence is needed to support the claim.
4. **Reasoning and synthesis**
    a. Students use the following chain of reasoning to connect the evidence:
        i. Because stars are defined as natural bodies that give off their own light, the Sun is a star.
        ii. The Sun is many times larger than Earth but appears small because it is very far away.
        iii. Even though the Sun is very far from Earth, it is much closer than other stars.
        iv. The Sun appears much larger and brighter than other objects in the sky because it is closest to Earth.
        v. Objects that are farther from Earth, may be more luminous and much larger than objects closer to Earth. Because of the distance, they may seem smaller and dimmer.
        vi. There are stars that are many times larger than the Sun and Earth, but vary in brightness because of their distance.
        vii. Similar stars vary in apparent brightness, indicating that they vary in distance from Earth.

5-ESS1-1 Academic Language

Question/Sentence Stems

- The scale of the model of ______ is ______ compared to the actual object.
- To understand the phenomenon of ______, I/we need to use a scaled model because ______.
- The apparent brightness of ______ is related to ______.
- When comparing ______ and ______, I/we can tell that ______.
- My/Our claim is ______. My/Our evidence from the investigation is ______.

Terminology to Support Student Discourse about Phenomena

*Teaching words or concepts in isolation or prior to experiences that give context (frontloading) deprives students of sense-making opportunities that lead to a greater depth of conceptual understanding.

- apparent brightness
- claim
- compare
- evidence
- proportion
- quantity
- relative distance
- scale
- star
- visible

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.

> ***Clarification Statement:*** Patterns could be revealed from graphical interpretations, various media, diagrams, models, or graphs constructed from data gathered from investigations. Examples of patterns could include the position and motion of Earth with respect to the Sun or selected stars that are visible only in particular months.
>
> ***State Assessment Boundary:*** Assessment does not include causes of seasons or labeling specific phases of the Moon.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Analyzing and Interpreting Data Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.	**ESS1.B: Earth and the Solar System** The orbits of Earth around the Sun and of the Moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the Sun, Moon, and stars at different times of the day, month, and year.	**Patterns** Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena.

Observable features of student performance by the end of the course:

1. **Organizing data**
    a. Students organize data (for example: bar graphs, pictographs, etc.), about daily and seasonal changes caused by the Earth's rotation and orbit around the Sun, including:
        i. length and direction of shadows observed several times during one day,
        ii. duration of daylight throughout the year, as determined by sunrise and sunset times, and
        iii. presence or absence of selected stars and/or groups of stars that are visible in the night sky at different times of the year.

2. **Identifying relationships**
    a. Students use the organized data to describe relationships, including:
        i. The apparent motion of the Sun from east to west results in patterns that show changes in length and direction of shadows throughout a day as Earth rotates on its axis.
        ii. The length of the day gradually changes throughout the year as Earth orbits the Sun, with longer days in the summer and shorter days in the winter.
        iii. Some stars and/or groups of stars (limited to constellations) can be visible in the sky all year, while others appear only at certain times of the year.
        iv. Similarities and differences in the timing of observable changes in shadows, daylight, and the appearance of stars show that events occur at different rates (for example: Earth rotates on its axis once a day, while its orbit around the Sun takes a full year).

5-ESS1-2 Academic Language

Question/Sentence Stems

- By observing the pattern of the Sun, I/we can tell ______.
- The observed pattern of ______ supports the conclusion that ______.
- ______ (time interval) changes in/of ______, I/we can predict that ______.

Terminology to Support Student Discourse about Phenomena

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- axis
- constellation
- east
- north
- North Pole
- observe
- orbit
- patterns
- planet
- revolves
- rotation
- south
- South Pole
- stars
- west

ESS2 – Earth's Systems

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

Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.

State Assessment Boundary: Assessment is limited to the interactions of two systems at a time.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Developing and Using Models Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model using an example to describe a scientific principle.	**ESS2.A: Earth Materials and Systems** Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.	**Systems and System Models** A system can be described in terms of its components and their interactions.

Observable features of student performance by the end of the course:

1. **Components of the model**
    a. Students develop/use a model to describe ways that the geosphere, biosphere, hydrosphere, and/or atmosphere interact and identify and describe the relevant components, including:
        i. geosphere (limited to solid and molten rock, soil, sediment, continents, mountains),
        ii. hydrosphere (limited to water and ice in the form of rivers, lakes, glaciers),
        iii. atmosphere (limited to wind, oxygen, water), and
        iv. biosphere (limited to plants, animals [including humans]).
2. **Relationships**
    a. Students develop/use a model to represent and describe relationships within and between the parts of the Earth systems identified in the model that are relevant to the example (for example: the atmosphere and the hydrosphere interact by exchanging water through evaporation and precipitation; the hydrosphere and atmosphere interact through air temperature changes, which lead to the formation or melting of ice, etc.).
3. **Connections**
    a. Students develop/use a model to describe a variety of ways in which the parts of two major Earth systems interact to affect the Earth's surface materials and processes. Students use the model to describe how parts of an individual Earth system:
        i. work together to affect the functioning of that Earth system, and
        ii. contribute to the functioning of the other relevant Earth system.

5-ESS2-1 Academic Language

Question/Sentence Stems

- The key components of the system are ______.
- In the system, ______ and ______ interact in ______ way.
- If I/you change ______ in the system, ______ will occur.
- Matter cycles ______ within the system.
- Energy flows ______ within the system.

Terminology to Support Student Discourse about Phenomena

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- atmosphere
- biosphere
- energy
- geosphere
- hydrosphere
- interact
- matter
- system

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

> ***State Assessment Boundary:*** Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Using Mathematics and Computational Thinking Mathematical and computational thinking in 3-5 builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. Describe and graph quantities such as area and volume to address scientific questions.	**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.	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight and volume.

*The exclusion of the atmosphere in the State Assessment Boundary is in direct conflict with the DCI foundation statement. Students should have the opportunity to make sense of the total distribution of water on Earth.

Observable features of student performance by the end of the course:

1. **Representation**
    a. Students graph data (using appropriate units) about the amount of salt water and the amount of fresh water in each of the following reservoirs, as well as in all the reservoirs combined:
        i. atmosphere,
        ii. glaciers,
        iii. ground water,
        iv. lakes,
        v. oceans,
        vi. polar ice caps, and
        vii. rivers.

2. **Mathematical/computational analysis**
    a. Students use graphs of the relative amounts of total salt water and total fresh water in each of the reservoirs to describe that:
        i. most of the water on Earth is found in the oceans,
        ii. most of the Earth's fresh water is stored in glaciers or underground, and
        iii. a small fraction of fresh water is found in lakes, rivers, wetlands, and the atmosphere.

5-ESS2-1 Academic Language

Question/Sentence Stems

- The quantity of ______ and ______ can be compared.
- What is the proportion of ______ that are ______?
- To understand the phenomenon of ______, I/we can use a scale of ______ in our model.

Terminology to Support Student Discourse about Phenomena

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- atmosphere
- compare
- distribution
- fraction
- freshwater
- glaciers
- ground water
- hydrosphere
- lake
- model
- ocean
- percentage
- polar ice caps
- proportion
- quantity
- reservoir
- river
- saltwater
- scale

ESS3 – Earth and Human Activity

5-ESS3-1. Evaluate potential solutions to problems that individual communities face in protecting *the Earth's resources and environment*.

Science and Engineering Practices	Disciplinary Core Ideas	*Crosscutting Concepts*
Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3-5 builds on K-2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.	**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. **ETS1.B: Developing Possible Solutions** Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. **ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World** Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.	**Systems and System Models** A system can be described in terms of its components and their interactions.

Observable features of student performance by the end of the course:

1. **Obtaining information**
    a. Students use grade-appropriate texts and other reliable media to obtain the following scientific information:
        i. a human activity (for example: in agriculture, industry, everyday life, etc.) that affects the Earth's resources and environments and
        ii. how a community uses scientific ideas to protect a given natural resource and the environment in which the resource is found.

2. **Evaluating information**
    a. Students synthesize information from at least two sources to provide and describe evidence about:
        i. positive and negative effects on the environment because of human activities and
        ii. how individual communities can use scientific ideas and a scientific understanding of interactions between components of environmental systems to protect a natural resource and the environment in which the resource is found.

5-ESS3-1 Academic Language

Question/Sentence Stems

- The key components of the system are ______.
- In the system, ______ and ______ interact in ______ way.
- If I/you change ______ in the system, ______ will occur.

Terminology to Support Student Discourse about Phenomena

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- conserve
- constraints
- criteria
- data
- environment
- evaluate
- impact
- interact
- optimal solutions
- proposed solutions
- resources
- system

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