STATE OF SOUTH CAROLINA
DEPARTMENT OF EDUCATION

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STATE SUPERINTENDENT OF EDUCATION

Third Grade Performance Targets

for the

South Carolina College- and Career-Ready Science Standards 2021

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Contents

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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 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.

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 Third Grade include all those previously identified and add or emphasize:

- balance
- beaker
- compass
- forceps
- graduate syringe
- graduated cylinder
- magnet
- meter stick/tape
- rain gauge
- spring scale
- thermometer
- timing device
- weather map

Acknowledgement

The office of Assessment and Standards science team greatly appreciates the input received from the committee members of the K-8 Off-tested Performance Target Review Committee.

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PS2 – Motion and Stability: Forces and Interactions

3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

Clarification Statement: Examples could include an unbalanced force on one side of a ball, which causes motion, and balanced forces pushing on a box from opposite sides, which does not cause motion.
State Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.

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. Plan and 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.	**PS2.A: Forces and Motion** Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. **PS2.B: Types of Interactions** Objects in contact exert forces on each other.	**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 describe the phenomenon under investigation involving the effects of different forces on an object's motion (for example: starting, stopping, or changing direction).
    b. Students describe the purpose of the investigation, to produce qualitative data to serve as the basis for evidence for how balanced and unbalanced forces determine an object's motion.

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2. **Identifying the evidence to address the purpose of the investigation**
    a. In the investigation plan, students describe the data to be collected and the evidence to be derived, including:
        i. The change in motion of an object at rest after:
            1. different strengths and directions of balanced forces are applied to the object (for example: equal force on the right, equal force on the left),
            2. different strengths and directions of unbalanced forces are applied to the object (for example: strong force on the right, weak force or the left, etc.), and
            3. what causes the forces on the object.
        ii. How the data collected is relevant to determining the effects of balanced and unbalanced forces on an object's motion.
3. **Planning the investigation**
    a. Students describe how the motion of the object will be observed and recorded, including:
        i. object whose motion will be investigated,
        ii. objects in contact that exert forces on each other,
        iii. changing one variable at a time (for example: control strength and vary the direction, or control direction and vary the strength), and
        iv. number of trials that will be conducted in the investigation to produce sufficient data.
4. **Collecting the data**
    a. Students collect and record data, including qualitative data from observations and/or measurements of:
        i. object at rest and the identification of the forces acting on the object and
        ii. object in motion and the identification of the forces acting on the object.

3-PS2-1 Academic Language

Question/Sentence Stems

- Some variables that can be changed are _____.
- Some variables that will remain the same are _____.
- _____ is an example of a balanced force. It is balanced because _____.
- _____ is an example of an unbalanced force. It is unbalanced because _____.
- In this situation, a change of _____ can cause _____.

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.

- balanced
- direction
- force
- gravitational force
- motion
- speed
- strength
- sum
- unbalanced
- variable
- zero net force

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3-PS2-2. Make observations and measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

Clarification Statement: Examples of motion with a predictable pattern could include a pendulum swinging, a ball rolling back and forth in a bowl, and two children on a seesaw. ***State Assessment Boundary:*** Assessment does not include technical terms such as period and frequency.

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/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.	**PS2.A: Forces and Motion** The patterns of an object's motion in various situations can be observed and measured, when that past motion exhibits a regular pattern, future motion can be predicted from it.	**Patterns** Patterns of change can be used to make predictions.

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

1. **Identifying the phenomenon under investigation**
    a. Students describe the phenomenon under investigation, which includes-observable patterns in the motion of an object.
    b. Students describe the purpose of the investigation, to provide evidence for the idea that patterns of motion can be used to predict future motion of an object.
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 data on the motion of the object as it repeats a pattern over time (for example: a pendulum swinging, a ball moving on a curved track, a magnet repelling another magnet, etc.).

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3. **Planning the investigation**
    a. In the investigation plan, students describe:
        i. how the motion of the object will be observed and measured,
        ii. evidence of a pattern in the motion of the object will be identified from the data on the motion of the object, and
        iii. the pattern in the motion of the object can be used to predict future motion.
4. **Collecting the data**
    a. Students collect and record data on the motion of the object, to identify a pattern that can be used to predict future motion.

3-PS2-2 Academic Language

Question/Sentence Stems

- In the data, I/we observe (notice) the pattern of _____.
- The pattern observed in the data allows me to conclude (know) that _____.
- The following predictions can be made about _____ when using the pattern of _____ found in the data.
- Some similarities in the patterns are _____.
- Some differences in the patterns are _____.

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.

- conclude
- direction
- evidence
- force
- investigation
- motion
- pattern
- prediction

3-PS2-3. Ask questions to determine cause-and-effect relationships of electric interactions and magnetic interactions between two objects not in contact with each other.

Clarification Statement: Examples could include the interactive force on hair from an electrically charged balloon or other instances of static electricity. Examples could include either the magnetic force between two permanent magnets or an electromagnet and steel paper clips. Examples of cause-and-effect relationships could include how the distance between objects affects strength of the force, how combining magnets affects the strength of the force, and how the orientation of magnets affects the direction of the force.
State Assessment Boundary: Assessment does not include electric interactions other than static electricity.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades 3-5 builds on grades K-2 experiences and progresses to specifying qualitative relationships. Ask questions that can be investigated based on patterns such as cause and effect relationships.	**PS2.B: Types of Interactions** Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.	**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. **Addressing phenomena of the natural world**
    a. Students formulate questions that arise from observations of two objects not in contact with each other interacting through electric or magnetic forces, to clarify the cause-and effect relationships between:
        i. qualitative size of the forces on the two interacting objects due to the distance between the two objects,
        ii. relative orientation of two magnets and whether the force between the magnets is attractive or repulsive,
        iii. presence of a magnet and the force the magnet exerts on other objects, and
        iv. electrically charged objects and an electric force.
2. **Identifying the scientific nature of the question**
    a. Student questions can be investigated within the scope of the classroom.

3-PS2-3 Academic Vocabulary

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.
- In this situation, a change of _____ can cause an effect of _____.
- I/We wonder _____.

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.

- attraction
- charge
- distance
- electric force
- interactions
- magnet
- magnetic force
- non-contact forces
- orientation
- properties
- static electricity
- strength

3-PS2-4. Develop possible solutions to a simple design problem by applying scientific ideas about magnets.

Clarification Statement: Examples could include latching a door to keep it shut or keeping objects apart, so they do not touch**.**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.	**PS2.B: Types of Interactions** Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. **ETS1.B: Developing Possible Solutions** Testing a solution involves investigating how well it performs under a range of likely conditions. **ETS2.A: Interdependence of Science, Engineering, and Technology** Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.	**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. **Using scientific knowledge to generate design solutions**
    a. Students describe a problem that can be solved by applying a scientific understanding of the forces between interacting magnets.
    b. Students identify and describe the scientific understanding necessary for solving the problem, including:
        i. force between objects do not require that those objects be in contact with each other and
        ii. the size of the force depends on the different properties of objects, distance between the objects, and orientation of magnetic objects relative to one another.

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2. **Describing features of the design solution, including quantification when appropriate**
    a. Students identify and describe the criteria (desirable features) for a successful solution to the problem.
    b. Students identify and describe the constraints (limits), including:
        i. time,
        ii. cost, and
        iii. materials
3. **Evaluating potential solutions**
    a. Students describe whether the design solution:
        i. meets the required features, and
        ii. provides a solution to the problem that can be solved by applying a scientific understanding of the forces interacting between magnets.

3-PS2-4 Academic Language

Question/Sentence Stems

- If _____ happens, I/we predict that _____ will occur.
- I/We wonder _____.
- The key components of the system are _____.
- In the system, _____ and _____ work together to _____.
- In the system, _____ and _____ interact in _____ way.
- If I/we remove _____ from the system _____ will happen.
- From these characteristics, I/we know that _____.

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.

- attraction
- charge
- distance
- electric force
- interactions
- magnet
- magnetic force
- orientation
- properties
- static electricity
- system

LS1 – From Molecules to Organisms: Structures and Processes

3-LS1-1. Develop and use models to describe how organisms change in predictable patterns during their unique and diverse life cycles.

Clarification Statement: Changes organisms go through during their life cycles could include birth/sprouting, growth, reproduction, and death.
State Assessment Boundary: Assessment does not include human examples or details of reproduction beyond two ways animals are born: live from mother or hatched from eggs.

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 models to describe phenomena.	**LS1.B: Growth and Development of Organisms** Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.	**Patterns** Patterns of change can be used to make predictions.

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

1. **Components of the model**
    a. Students develop/use a (for example: conceptual, physical, drawing, etc.) to identify and describe relevant components, including:
        i. organisms (both plant and animal),
        ii. birth,
        iii. growth,
        iv. reproduction, and
        v. death.
2. **Relationships**
    a. Students develop/use a model to represent and describe relationships between components, including:
        i. Organisms are born, grow, and die in a pattern known as a life cycle.
        ii. Different organisms' life cycles can look very different.
        iii. The cause-and-effect relationships of the cycle (for example: without birth, there is no growth, without reproduction, there are no births, etc.).

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3. **Connections**
    a. Students develop/use a model to describe:
        i. Organisms can display life cycles that look different but they all follow the same pattern.
        ii. How to make predictions using patterns identified among life cycles (for example: if there are no births, deaths will continue and eventually that organism will no longer exist, etc.).
        iii. What kinds of phenomena can interrupt the life cycle of an organism.

3-LS1-1 Academic Language

Question/Sentence Stems

- Some changes I/we noticed in this organism's life cycle are _____.
- During the life cycle this organism stayed the same by _____.
- I/We can represent stages of life in a model by _____.
- I/We can predict the next stage of life is _____. I/we know this 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.

- birth
- death
- growth
- life cycle
- model
- organisms
- predict
- reproduction
- stages of life

LS2 – Ecosystems: Interactions, Energy, and Dynamics

3-LS2-1. Construct an argument that some animals form groups that help members survive.

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). Construct an argument with evidence, data, and/or a model.	**LS2.D: Social Interactions and Group Behavior** Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. Groups can be collections of equal individuals, hierarchies with dominant members, small families, groups of single or mixed gender, or groups composed of individuals similar in age. Some groups are stable over long periods of time, others are fluid, with members moving in and out. Some groups assign specialized tasks to each member, in others, all members perform the same or a similar range of functions.	**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, or refute a claim that some animals form groups and that being a member of that group helps each member survive.
2. **Identifying scientific evidence**
    a. Students describe the given evidence, data, and/or models necessary to support or refute a claim, including:
        i. Identifying types of animals that form or live in groups of varying sizes.
        ii. Multiple examples of animals in groups of various sizes, for example:
            1. Obtaining more food for each individual animal compared to the same type of animal looking for food individually.
            2. Displaying more success in defending themselves than those same animals acting alone.
            3. Making faster or better adjustments to harmful changes in their ecosystem than would those same animals acting alone.

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3. **Evaluating and critiquing evidence**
    a. Students evaluate and identify the strengths and weaknesses of the evidence to determine its relevance, and whether it supports the claim that being a member of a group has a survival advantage.
4. **Reasoning and synthesis**
    a. Students use the following chain of reasoning to connect the evidence:
        i. Being part of a group can have the effect of animals being more successful in obtaining food, defending themselves, and coping with change supports the claim that being a member of a group helps animals survive.
        ii. An animal losing its group status can have the effect of the animal obtaining less food, not being able to defend itself, and not being able to cope with change supports the claim that being a member of a group helps animals survive.

3-LS2-1 Academic Language

Question/Sentence Stems

- My claim is _____. My evidence from the investigation is _____.
- If _____ happens, I/we predict that _____ will occur.
- In this situation, a change of _____ can cause an effect of _____.
- A possible cause of what I/we observed is _____. I/we know this because _____.
- Some behaviors I/we noticed are _____. This helped the organism survive 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.

- animals
- behavior
- claim
- evidence
- organism
- reasoning
- survival

LS3 – Heredity: Inheritance and Variation of Traits

3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have inherited traits that vary within a group of similar organisms.

Clarification Statement: Similarities and differences in shared traits form patterns among parents, siblings, and offspring.
State Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.

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. Analyze and interpret data to make sense of phenomena using logical reasoning.	**LS3.A: Inheritance of Traits** Many characteristics of organisms are inherited from their parents. **LS3.B: Variation of Traits** Different organisms vary in how they look and function because they have different inherited information.	**Patterns** Similarities and differences in patterns can be used to sort and classify natural phenomena.

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

1. **Organizing data**
    a. Students organize data (for example: from students' previous work, grade-appropriate existing datasets, etc.) using graphical displays (for example: table, chart, graph, etc.), including:
        i. traits of plant and animal parents,
        ii. traits of plant and animal offspring, and
        iii. variations in similar traits in a grouping of similar organisms.

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2. **Identifying relationships**
    a. Students use the organized data to identify and describe patterns, including:
        i. similarities in the traits of a parent and the traits of an offspring (for example: tall plants typically have tall offspring, etc.),
        ii. similarities in traits among siblings (for example: siblings often resemble each other),
        iii. differences in traits in a group of similar organisms (for example: dogs come in many shapes and sizes, a field of corn plants have plants of different heights, etc.),
        iv. differences in traits of parents and offspring (for example: offspring do not look exactly like their parents), and
        v. differences in traits among siblings (for example: kittens from the same mother may not look exactly like their mother, etc.).
3. **Interpreting data**
    a. Students use the analyzed data to describe:
        i. The pattern of similarities in traits between parents and offspring, and between siblings, provide evidence that traits are inherited.
        ii. The pattern of differences in traits between parents and offspring, and between siblings, provide evidence that inherited traits can vary.
        iii. The variation in inherited traits results in a pattern of variation of traits in groups of organisms that are of a similar type (limited to: a population,a species).

3-LS3-1 Academic Language

Question/Sentence Stems

- In the data I/we observed the pattern _____.
- My/Our conclusion is supported by _____.
- I/We can make the prediction _____using the pattern of _____.
- Some variations of traits in this group of organisms are _____.
- _____ are some similarities and differences between the parents and their offspring.

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.

- characteristic
- inherited
- offspring
- parent
- reproduction
- trait
- variation

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.

Clarification Statement: Examples could include stunted growth in plants due to insufficient resources or obesity in animals that eat too much and get little exercise.
State Assessment Boundary: Assessment is limited to non-human examples.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation.	**LS3.A: Inheritance of Traits** Some characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. **LS3.B: Variation of Traits** The environment affects the traits that an organism develops.	**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. **Articulating the explanation of phenomena**
    a. Students articulate a statement that many inherited traits can be influenced by the environment.
2. **Evidence**
    a. Students identify and describe the ~~given~~ evidence that supports the explanation, including:
        i. environmental factors that vary for organisms of the same type (for example: amount or food, amount of water, amount of exercise an animal gets, chemicals in the water, etc.) that may influence organisms' traits,
        ii. inherited traits that vary between organisms of the same type (for example: height or weight of a plant or animal, color or quantity of the flowers, etc.), and
        iii. observable inherited traits of organisms in varied environmental conditions

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3. **Reasoning**
    a. Students use the following chain of reasoning to connect the evidence to support or refute an explanation:
        i. cause-and-effect relationship between a specific environmental factor and
        ii. effect of a given variation in a trait (for example: not enough water produces plants that are shorter and have fewer flowers than plants that had more water available, etc.).

3-LS3-2 Academic Language

Question/Sentence Stems

- From these characteristics, I/we know that _____.
- My/Our claim is _____. My evidence from the investigation is _____.
- If _____ happens, I/we predict that _____ will occur.
- If I/we _____ this will cause _____.
- _____ evidence presented in the model 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.

- cause
- characteristics
- claim
- depend
- ecosystem
- effect
- environment
- evidence
- habitat
- inherited
- organism
- relationship
- survival
- system
- traits

LS4 – Biological Evolution: Unity and Diversity

3-LS4-1. Analyze and interpret data from fossils to provide evidence of organisms and the environments in which they lived long ago.

Clarification Statement: Examples could include marine fossils found on dry land and tropical plant fossils found in cold regions.
State Assessment Boundary: Assessment does not include identification of specific fossils or fossils of organisms still in existence. Assessment is limited to major fossil types and relative ages.

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. Analyze and interpret data to make sense of phenomena using logical reasoning.	**LS4.A: Evidence of Common Ancestry and Diversity** Some kinds of plants and animals that once lived on Earth are no longer found anywhere. Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.	**Scale, Proportion, and Quantity** Observable phenomena exist from very short to very long time periods.

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

1. **Organizing data**
    a. Students organize data to represent:
        i. fossils of animals (for example: information on type, size, type of land on which it was found, etc.),
        ii. fossils of plants (for example: information on type, size, type of land on which it was found, etc.),
        iii. relative ages of fossils (for example: from a very long time ago), and
        iv. existence of modern counterparts to the fossilized plants and animals and information on where they currently live.

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2. **Identifying relationships**
    a. Students use the organized data to identify and describe relationships, including:
        i. fossils represent plants and animals that lived long ago.
        ii. The relationships between the fossils of organisms and the environments in which they lived (for example: marine organisms, like fish, must have lived in water environments, etc.),
        iii. relationships between types of fossils (for example: those of marine animals, etc.) and the current environments where similar organisms are found,
        iv. some fossils represent organisms that lived long ago and have no modern counterparts,
        v. relationships between fossils of organisms that lived long ago and their modern counterparts, and/or
        vi. relationships between existing animals and the environments in which they currently live.
3. **Interpreting data**
    a. Students use the analyzed data to describe:
        i. Fossils provide evidence of organisms that lived long ago but have become extinct (for example: dinosaurs, mammoths, other organisms that have no clear modern counterpart, etc.).
        ii. The features of fossils provide evidence of organisms that lived long ago and of what types of environments those organisms must have lived in (for example: fossilized seashells indicate shelled organisms that lived in aquatic environments, etc.).
        iii. By comparing data about where fossils are found and what those environments are like, fossilized plants and animals can be used to provide evidence that some environments look very different now than they did a long time ago (for example: fossilized seashells found on land that is now dry suggest that the area in which those fossils were found used to be aquatic, tropical plant fossils found in Antarctica, where tropical plants cannot live today, suggests that the area used to be tropical, etc.).

3-LS4-1 Academic Language

Question/Sentence Stems

- Evidence of _____ shows that _____.
- When comparing _____ and _____, I/we can tell that _____.
- The quantity of _____ and _____ can be compared.
- 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.

- animals
- dry
- environment
- evidence
- fossils
- marine
- organism
- plants
- quantity
- relative age
- tropical

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3-LS4-2. Use evidence to construct an explanation for how the variations in traits among individuals of the same species may provide advantages in surviving and producing offspring.

Clarification Statement: Examples could include plants that have larger thorns than other plants may be less likely to be eaten, or animals that have better camouflage may be more likely to survive and produce offspring.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to construct an explanation.	**LS4.B: Natural Selection** Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.	**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. **Articulating the explanation of phenomena**
    a. Students articulate a statement describing/explaining that variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
2. **Evidence**
    a. Students identify and describe the evidence, including:
        i. given characteristic of a species (for example: thorns on a plant, camouflage of an animal, the coloration of moths, etc.),
        ii. patterns of variation of a given characteristic among individuals in a species (for example: longer or shorter thorns on individual plants, dark or light coloration of animals, etc.), and
        iii. potential benefits of a given variation of the characteristic (for example: the light coloration of some moths makes them difficult to see on the bark of a tree, etc.).

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3. **Reasoning**
    a. Students use the following chain of reasoning to connect the evidence to support or refute an explanation:
        i. Certain variations in characteristics make it harder or easier for an animal to survive, find mates, and reproduce (for example: longer thorns prevent predators more effectively and increase the likelihood of survival, light coloration of some moths provides camouflage in certain environments, making it more likely that they will live long enough to be able to mate and reproduce, etc.).
        ii. The characteristics that make it easier for some organisms to survive, find mates, and reproduce (for example: camouflage, mimicry, grouping, hibernation, etc.) give those organisms an advantage over other organisms of the same species that don't have those traits.
        iii. There can be a cause-and-effect relationship between a specific variation in a characteristic (for example: longer thorns, coloration of moths, etc.) and its effect on the ability of the individual organism to survive and reproduce (for example: plants with longer thorns are less likely to be eaten, darker moths are less likely to be seen and eaten on dark trees, etc.).

3-LS4-2 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.
- In this situation, a change of _____ can cause an effect of _____

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.

- advantage
- behavior
- cause
- characteristics
- effect
- environment
- evidence
- natural selection
- offspring
- reproduce
- solution
- species
- survive
- traits
- variation

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3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can thrive, struggle to survive, or fail to survive.

Clarification Statement: Examples could include needs and characteristics of the organisms and habitats involved. Changes in a habitat are sometimes beneficial, sometimes neutral, or sometimes harmful to an organism.

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). Construct an argument with evidence.	**LS4.C: Adaptation** Adaptation can lead to organisms that are better suited for their environment. For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.	**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, or refute a claim that in a particular habitat, some organisms can survive well, some can survive less well, and some cannot survive at all.
2. **Identifying scientific evidence**
    a. Students identify and describe the evidence, including:
        i. characteristics of a particular environment (for example: soft earth, trees and shrubs, seasonal flowering plants, etc.),
        ii. characteristics of a particular organism (for example: plants with long, sharp leaves, rabbit coloration, etc.), and
        iii. needs of a particular organism (for example: shelter from predators, food, water, etc.).

(Continued on next page.)

3. **Evaluating and critiquing evidence**
    a. Students evaluate and identify the strengths and weaknesses of the evidence, including:
        i. The characteristics of organisms that might affect survival.
        ii. The similarities and differences in needs among at least three types of organisms.
        iii. How and what features of the habitat meet the needs of each of the organisms (limited to the degree to which a habitat meets the needs of an organism).
        iv. How and what features of the habitat do not meet the needs of each of the organisms (limited to the degree to which a habitat does not meet the needs of an organism).
4. **Reasoning and synthesis**
    a. Students use the following chain of reasoning to construct an argument, including describing that any particular environment meets different organisms' needs to different degrees due to the characteristics of that environment and the needs of the organisms:
        i. If an environment fully meets the needs of an organism, that organism can survive well within that environment.
        ii. If an environment partially meets the needs of an organism, that organism can survive less well (for example: lower survival rate, increased sickliness, shorter lifespan, etc.) than organisms whose needs are met within that environment.
        iii. If an environment does not meet the needs of the organism, that organism cannot survive within that environment.
        iv. Together, the evidence suggests a cause-and-effect relationship within the system between the characteristics of a habitat and the survival of organisms within it.

3-LS4-3 Academic Language

Question/Sentence Stems

- Evidence of _____ shows that _____.
- My/Our claim is _____. My/Our evidence from the investigation is _____.
- A possible cause of what I/we observed is _____. I/We know this because _____.
- In this situation, a change of _____ can cause an effect of _____.

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
- depend
- ecosystem
- effect
- environment
- evidence
- habitat
- needs
- organism
- relationship
- survival

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3-LS4-4. Make a claim about the effectiveness of a solution to a problem caused when the environment changes and affects organisms living there.

Clarification Statement: Examples could include changes within a system such as land characteristics, water distribution, temperature, food, and other organisms.
State Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.

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). Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (*secondary*) **LS4.D: Biodiversity and Humans** Populations live in a variety of habitats and change in those habitats affects the organisms living there. **ETS1.C: Optimizing the Design Solution** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. **ETS2.A: Interdependence of Science, Engineering, and Technology** Knowledge of relevant scientific concepts and research findings is important in engineering.	**Systems and System Models** A system can be described in terms of its components and their interactions.

(Continued on next page.)

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

1. **Supported claims**
    a. Students make, support, or refute a claim about the merit of a solution to a problem that is caused when the environment changes, which results in changes in the types of plants and animals that live there.
2. **Identifying scientific evidence**
    a. Students identify and describe the evidence:
        i. A system of plants, animals, and a given environment within which they live before the given environmental change occurs.
        ii. A given change in the environment.
        iii. How the change in the given environment causes a problem for the existing plants and animals living within that area.
        iv. The effect of the solution on the plants and animals within the environment.
        v. The resulting changes to plants and animals living within that changed environment, after the solution has been implemented.
3. **Evaluating and critiquing evidence**
    a. Students evaluate the solution to the problem to determine the merit of the solution and describe how well the proposed solution meets the criteria and constraints to reduce the impact of the problem created by the environmental change in the system, including:
        i. How well the proposed solution meets the given criteria and constraints to reduce the impact of the problem created by the environmental change in the system, including:
            1. How the solution makes changes to one part (for example: a feature of the environment) of the system, affecting the other parts of the system (for example: plants and animals).
            2. How the solution affects plants and animals.

3-LS4-4 Academic Language

Question/Sentence Stems

- An idea to address this problem is _____.
- _____ are some similarities and differences among the solutions.
- The _____[event] changed this system by _____.
- Over time, _____ stayed the same.
- Over time, _____ was impacted.

Terminology to Support Student Discourse about Phenomena

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- cause
- claim
- constraints
- criteria
- environment
- evaluate
- evidence
- impact
- organism
- problem
- resources
- solution
- survive

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ESS2 – Earth's Systems

3-ESS2-1. Represent data in tables and graphical displays of typical weather conditions during a particular season to identify patterns and make predictions.

Clarification Statement: Examples could include making predictions about weather conditions based on average temperature, precipitation, and wind direction.
State Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.

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 tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.	**ESS2.D: Weather and Climate** Weather, which varies from day to day and seasonally throughout the year, is the condition of the atmosphere at a given place and time. Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.	**Patterns** Patterns of change can be used to make predictions.

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

1. **Organizing data**
    a. Students organize data by season using tables, pictographs, and/or bar charts, including:
        i. weather condition data from the same area across multiple seasons (for example: average temperature, precipitation, wind direction, etc.), and
        ii. weather condition data from different areas (for example: hometown and nonlocal areas, such as a town in another state, etc.).
2. **Identifying relationships**
    a. Students use the organized data to identify and describe patterns of weather conditions across:
        i. Different seasons (for example: cold and dry in the winter, hot and wet in the summer, more or less wind in a particular season, etc.).
        ii. Different areas (for example: certain areas (defined by location, such as a town in the Pacific Northwest), have high precipitation, while a different area (based on location or type, such as a town in the Southwest) have very little precipitation).

3. **Interpreting data**
    a. Students use the analyzed data to describe patterns of weather conditions in different seasons and different areas to predict:
        i. The typical weather conditions expected during a particular season (for example: "In our town in the summer it is typically hot, as indicated on a bar graph over time, while in the winter it is typically cold, therefore, the prediction is that next summer it will be hot and next winter it will be cold.").
        ii. The typical weather conditions expected during a particular season in different areas.

3-ESS2-1 Academic Language

Question/Sentence Stems

- I/We can represent my data using _____.
- In the data I/we observed the pattern _____.
- The pattern I/we observed shows _____.
- After looking at the patterns in the data I/we wonder _____.
- From my data, I/we can predict _____.
- Some similarities and differences in the data are _____.

Terminology to Support Student Discourse about Phenomena

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- average
- data
- graph
- patterns
- precipitation
- prediction
- season
- sunlight
- table
- temperature
- weather
- weather conditions
- wind direction
- wind speed

3-ESS2-2. Obtain and combine information to describe climate patterns in different regions of the world.

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 other reliable media to explain phenomena.	**ESS2.D: Weather and Climate** Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.	**Patterns** Similarities and differences in patterns can be used to sort and classify natural phenomena.

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. climates in different regions of the world (for example: equatorial, polar, coastal, mid-continental, etc.) and
        ii. variations in climates within different regions of the world (for example: variations could include an area's average temperatures and precipitation during various months over several years or an area's average rainfall and temperatures during the rainy season over several years, etc.).
2. **Evaluating information**
    a. Students synthesize the information to provide evidence about the climate pattern in a region that can be used to make predictions about typical weather conditions in that region.
3. **Communicating information**
    a. Students use the information they obtained and combined to describe:
        i. climates in different regions of the world,
        ii. examples of how patterns in climate could be used to predict typical weather conditions, and
        iii. that climate can vary over years in different regions of the world.

3-ESS2-2 Academic Language

Question/Sentence Stems

- From my source(s) I/we learned _____, this explained the pattern of _____.
- My conclusion is supported by _____.
- I/We know my source is reliable because _____.
- In the data I/we observed the pattern _____.
- The sources seem to be related because _____.
- Some similarities and differences between the sources are _____.

Terminology to Support Student Discourse about Phenomena

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- average
- climate
- patterns
- precipitation
- prediction
- region
- seasonal
- temperature
- typical
- weather conditions

ESS3 – Earth and Human Activity

3-ESS3-1. Make a claim about the effectiveness of a design solution that reduces the impacts of a weather related hazard.

Clarification Statement: Examples of design solutions could include barriers to prevent flooding, wind resistant roofs, and lighting rods.

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). Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	**ESS3.B: Natural Hazards** A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. **ETS1.C: Optimizing the Design Solution** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. **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 (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones).	**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. **Supported claims**
    a. Students make, support, or refute a claim about the merit of a design solution that reduces the impact of a weather-related hazard.

(Continued on next page.)

2. **Identifying scientific evidence**
    a. Students identify and describe evidence about the design solution, including:
        i. the weather-related hazard (for example: heavy rain or snow, strong winds, lightning, flooding along riverbanks, etc.),
        ii. problems caused by the weather-related hazard (for example: heavy rains cause flooding, lightning causes fires, etc.), and
        iii. how the proposed solution addresses the problem (for example: dams and levees are designed to control flooding, lightning rods reduce the chance of fires, etc.).

3. **Evaluating and critiquing evidence**

    b. Students evaluate the evidence using given criteria and constraints to determine:
        i. How the proposed solution addresses the problem, including the impact of the weather-related hazard after the design solution has been implemented.
        ii. The merits of a given solution in reducing the impact of a weather-related hazard (limited to: whether the design solution meets the given criteria and constraints).
        iii. The benefits and risks a solution poses when responding to the societal demand to reduce the impact of a hazard.

3-ESS3-1 Academic Language

Question/Sentence Stems

- When I/we change _____, _____ is affected.
- In this situation, even a small change of _____ can cause a big effect of _____.
- I/We think that _____ caused _____ . I/We know this because _____.
- Testing the design can provide evidence that _____ causes _____ because _____.
- _____ are some similarities and differences among the solutions.
- I/We can optimize my solution 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.

- cause
- constraints
- criteria
- data
- effect
- modify
- optimizing solutions
- problem
- solution
- test
- weather-related hazard

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