KINDERGARTEN

The performance expectations in kindergarten help students formulate answers to questions such as: “What happens if you push or pull an object harder? Where do animals live and why do they live there? What is the weather like today and how is it different from yesterday?” Kindergarten performance expectations include PS2, PS3, LS1, ESS2, ESS3, and ETS1

Disciplinary Core Ideas from the NRC Framework. Students are expected to develop understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for, and respond to, severe weather. Students are able to apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution. Students are also expected to develop understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live.

The crosscutting concepts of patterns; cause and effect; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the kindergarten performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

K. Forces and Interactions: Pushes and Pulls

Students who demonstrate understanding can:

K-PS2-1

Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

K-PS2-2

Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.* [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

K-PS2-1

Students who demonstrate mastery can: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.

Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • With guidance, plan and conduct an investigation in collaboration with peers. **Connections to the Nature of Science** **Scientific Investigations Use a Variety of Methods** • Scientists use different ways to study the world.	**PS2.A: Forces and Motion** • Pushes and pulls can have different strengths and directions. • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **PS2.B: Types of Interactions** • When objects touch or collide, they push on one another and can change motion. **PS3.C: Relationship Between Energy and Forces** • A bigger push or pull makes things speed up or slow down more quickly. (*secondary*)	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

K-PS2-2

Students who demonstrate understanding can: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*

Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.

Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data • Analyze data from tests of an object or tool to determine if it works as intended.	**PS2.A: Forces and Motion** • Pushes and pulls can have different strengths and directions. • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **ETS1.A: Defining Engineering Problems** • A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (*secondary*)	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

K. Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment

Students who demonstrate understanding can:

K-LS1-1

Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

K-ESS2-2

Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete, or local plant and animal observations.]

K-ESS3-1

Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system. Explain the characteristics of the model and the relationships.]

K-ESS3-3

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.* [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]

K-LS1-1

Students who demonstrate understanding can: Use observations to describe patterns of what plants and animals (including humans) need to survive.

Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world.	**LS1.C: Organization for Matter and Energy Flow in Organisms** • All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.	**Patterns** • Patterns in the natural and human designed world can be observed and used as evidence.

K-ESS2-2

Students who demonstrate understanding can: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete, or local plant and animal observations.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence • Construct an argument with evidence to support a claim.	**ESS2.E: Biogeology** • Plants and animals can change their environment. **ESS3.C: Human Impacts on Earth Systems** • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (*secondary*)	**Systems and System Models** • Systems in the natural and designed world have parts that work together.

K-ESS3-1

Students who demonstrate understanding can: Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system. Explain the characteristics of the model and the relationships.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Use a model to represent relationships in the natural world.	**ESS3.A: Natural Resources** • Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.	**Systems and System Models** • Systems in the natural and designed world have parts that work together

K-ESS3-3

Students who demonstrate understanding can: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*

Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information • Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.	**ESS3.C: Human Impacts on Earth Systems** • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. **ETS1.B: Developing Possible Solutions** • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (*secondary*)	**Cause and Effect** • Events have causes that generate observable patterns.

K. Weather and Climate

Students who demonstrate understanding can:

K-PS3-1

Make observations to determine the effect of sunlight on Earth's surface. [Clarification Statement: Local observation of duration of sunlight. Examples of Earth's surface could include sand, soil, rocks, and water.] [*Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.*]

K-PS3-2

Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.* [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun. Explain the characteristics of the structure and their effect on the temperature.]

K-ESS2-1

Use and share observations of local weather conditions to describe patterns over time. [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [*Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.*]

K-ESS3-2

Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* [Clarification Statement: Emphasis is on local forms of severe weather.]

K-PS3-1

Students who demonstrate understanding can: Make observations to determine the effect of sunlight on Earth's surface.

Clarification Statement: Local observation of duration of sunlight. Examples of Earth's surface could include sand, soil, rocks, and water.

Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • Make observations (firsthand or from media) to collect data that can be used to make comparisons. **Connections to Nature of Science** **Scientific Investigations Use a Variety of Methods** • Scientists use different ways to study the world.	**PS3.B: Conservation of Energy and Energy Transfer** • Sunlight warms Earth's surface.	**Cause and Effect** • Events have causes that generate observable patterns.

K-PS3-2

Students who demonstrates understanding can: Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.*

Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun. Explain the characteristics of the structure and their effect on the temperature.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions • Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.	**PS3.B: Conservation of Energy and Energy Transfer** • Sunlight warms Earth's surface.	**Cause and Effect** • Events have causes that generate observable patterns.

K-ESS2-1

Students who demonstrate understanding can: Use and share observations of local weather conditions to describe patterns over time.

Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.

Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. **Connections to Nature of Science** **Science Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world.	**ESS2.D: Weather and Climate** • Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.	**Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

K-ESS3-2

Students who demonstrate understanding can: Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*

Clarification Statement: Emphasis is on local forms of severe weather.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions based on observations to find more information about the designed world. **Obtaining, Evaluating, and Communicating Information** • Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world.	**ESS3.B: Natural Hazards** • Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. **ETS1.A: Defining and Delimiting an Engineering Problem** • Asking questions, making observations, and gathering information are helpful in thinking about problems. (*secondary*)	**Cause and Effect** • Events have causes that generate observable patterns. **Connections to Engineering, Technology, and Applications of Science** **Interdependence of Science, Engineering, and Technology** • People encounter questions about the natural world every day. **Influence of Engineering, Technology, and Science on Society and the Natural World** • People depend on various technologies in their lives; human life would be very different without technology.