Arkansas Science Standards Alignment to FOSS Next Generation

GRADE K-PS2

Forces and Interactions: Pushes and Pulls

Performance Expectation K-PS2-1

Students who demonstrate understanding 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.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations **Scientific Investigations Use a Variety of Methods**	**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.	**Cause and Effect** Simple tests can be designed to gather evidence to support or refute student ideas about causes.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Materials and Motion Investigations Guide:

Investigation 4, Parts 1-4

Materials and Motion Science Resources Book:

"Pushes and Pulls"
"Collisions"

GRADE K-PS2

Forces and Interactions: Pushes and Pulls

Performance Expectation 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 a solution 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]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data	**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.	**Cause and Effect** Simple tests can be designed to gather evidence to support or refute student ideas about causes.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Materials and Motion Investigations Guide:

Investigation 4, Parts 1-4

Materials and Motion Science Resources Book:

"Pushes and Pulls"

"Collisions"

GRADE K-PS3

Weather and Climate

Performance Expectation K-PS3-1

Students who demonstrate understanding can:

Make observations to determine the effect of sunlight on Earth's surface.

[Clarification Statement: 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.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations **Scientific Investigations Use a Variety of Methods**	**PS3.B: Conservation of Energy and Energy Transfer** Sunlight warms Earth's surface.	**Cause and Effect** Events have causes that generate observable patterns.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Trees and Weather Investigations Guide:

Investigation 3, Parts 1-3

Trees and Weather Science Resources Book:

"Up in the Sky"
"Weather"

GRADE K-PS3

Weather and Climate

Performance Expectation K-PS3-2

Students who demonstrate 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.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**PS3.B: Conservation of Energy and Energy Transfer** Sunlight warms Earth's surface.	**Cause and Effect** Events have causes that generate observable patterns.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Trees and Weather Investigations Guide:

Investigation 3, Parts 1-3

Trees and Weather Science Resources Book:

"Up in the Sky"
"Weather"

GRADE K-ESS2

Weather and Climate

Performance Expectation 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, or 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 or the number of sunny days versus cloudy days in different months.]

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data **Science Knowledge is Based on Empirical Evidence**	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Trees and Weather Investigations Guide:

Investigation 3, Pts. 1-3 Investigation 4, Pts. 1-9

Trees and Weather Science Resources Book:

"Up in the Sky"
"Weather"
"My Apple Tree"
"Orange Trees"
"Maple Trees"

GRADE K-ESS3

Weather and Climate

Performance Expectation 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.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems **Obtaining, Evaluating, and Communicating Information**	**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.	**Cause and Effect** Events have causes that generate observable patterns. **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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Trees and Weather Investigations Guide:

Investigation 3, Parts 1-3

Trees and Weather Science Resources Book:

"Up in the Sky"
"Weather"

GRADE K-LS1

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

Performance Expectation 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.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data **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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Animals Two by Two Investigations Guide:

Investigation 1, Pts. 1-5
Investigation 2, Pts. 1-3
Investigation 3, Pts. 1-3
Investigation 4, Pts. 1-4

Animals Two by Two Science Resources Book:

"Fish Same and Different"
"Fish Live in Many Places"
"Birds Outdoors"
"Water and Land Snails"
"Worms in Soil"
"Isopods"
"Animals All around Us"
"Living and Nonliving"

GRADE K-ESS2

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

Performance Expectation 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 squirrels digging in the ground to hide food and tree roots breaking concrete.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence	**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.	**Systems and System Models** Systems in the natural and designed world have parts that work together.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Animals Two by Two Investigations Guide:

Investigation 1, Pts. 1-5
Investigation 2, Pts. 1-3
Investigation 3, Pts. 1-3
Investigation 4, Pts. 1-4

Animals Two by Two Science Resources Book:

"Fish Same and Different"
"Fish Live in Many Places"
"Birds Outdoors"
"Water and Land Snails"
"Worms in Soil"
"Isopods"
"Animals All around Us"
"Living and Nonliving"

GRADE K-ESS3

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

Performance Expectation K-ESS3-1

Students who demonstrate understanding can:

Use a model to represent the relationship between the needs of different plants or 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.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Animals Two by Two Investigations Guide:

Investigation 1, Pts. 1-5
Investigation 2, Pts. 1-3
Investigation 3, Pts. 1-3
Investigation 4, Pts. 1-4

Animals Two by Two Science Resources Book:

"Fish Same and Different"
"Fish Live in Many Places"
"Birds Outdoors"
"Water and Land Snails"
"Worms in Soil"
"Isopods"
"Animals All around Us"
"Living and Nonliving"

GRADE K-ESS3

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

Performance Expectation 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.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information	**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.	**Cause and Effect** Events have causes that generate observable patterns.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Animals Two by Two Investigations Guide:

Investigation 1, Pts. 1-5
Investigation 2, Pts. 1-3
Investigation 3, Pts. 1-3
Investigation 4, Pts. 1-4

Animals Two by Two Science Resources Book:

"Fish Same and Different"
"Fish Live in Many Places"
"Birds Outdoors"
"Water and Land Snails"
"Worms in Soil"
"Isopods"
"Animals All around Us"
"Living and Nonliving"

GRADE K-ETS1

Science Technology and Application of Science

Performance Expectation K-ETS1-1

Students who demonstrate understanding can:

Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems	**ETS1.A: Defining and Delimiting Engineering Problems** A situation that people want to change or create can be approached as a problem to be solved through engineering. Asking questions, making observations, and gathering information are helpful in thinking about problems. Before beginning to design a solution, it is important to clearly understand the problem.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Materials and Motion Investigations Guide:

Investigation 1, Pt. 3
Investigation 2, Pts. 4-5
Investigation 3, Pt. 6
Investigation 4, Pts. 2-3

Materials and Motion Science Resources Book:

"Are You an Engineer?"
"Collisions"

GRADE K-ETS1

Science Technology and Application of Science

Performance Expectation K-ETS1-2
Students who demonstrate understanding can: **Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models	**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.	**Structure and Function** The shape and stability of structures of natural and designed objects are related to their function(s).

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Materials and Motion Investigations Guide:

Investigation 1, Pt. 3
Investigation 2, Pts. 4-5
Investigation 3, Pt. 6
Investigation 4, Pts. 2-3

Materials and Motion Science Resources Book:

"Collisions"
"Are You an Engineer?"

Arkansas K-4 Science Standards Alignment

GRADE K-ETS1

Science Technology and Application of Science

Performance Expectation K-ETS1-3
Students who demonstrate understanding can: **Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data	**ETS1.C: Optimizing the Design Solution** Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Materials and Motion Investigations Guide:

Investigation 1, Pt. 3
Investigation 2, Pts. 4-5
Investigation 3, Pt. 6
Investigation 4, Pts. 2-3

Materials and Motion Science Resources Book:

"Are You an Engineer?"
"Collisions"

GRADE 1-PS4

Waves: Light and Sound

Performance Expectation 1-PS4-1

Students who demonstrate understanding can:

Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

[Clarification Statement: Examples of vibrating materials that make sound could include striking a tuning fork and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations **Scientific Investigations Use a Variety of Methods** Science investigations begin with a question. Scientists use different ways to study the world.	**PS4.A: Wave Properties** Sound can make matter vibrate, and vibrating matter can make sound.	**Cause and Effect** Simple tests can be designed to gather evidence to support or refute student ideas about causes.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Sound and Light Investigations Guide:

Investigation 1, Parts 1-3
Investigation 2, Parts 1-4

Sound and Light Science Resources Book:

"Vibrations and Sound"
"Listen to This"
"Animal Ears and Hearing"
"Strings in Motion"
"More Musical Instruments"

GRADE 1-PS4

Waves: Light and Sound

Performance Expectation 1-PS4-2

Students who demonstrate understanding can:

Make observations to construct an evidence-based account that objects can be seen only when illuminated.

[Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**PS4.B: Electromagnetic Radiation** Objects can be seen if light is available to illuminate them or if they give off their own light.	**Cause and Effect** Simple tests can be designed to gather evidence to support or refute student ideas about causes.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Sound and Light Investigations Guide:

Investigation 3, Parts 1-3
Investigation 4, Parts 1-4

Sound and Light Science Resources Book:

"Playing in the Light"
"Reflections"
"Seeing the Light"
"Communicating with Light"

GRADE 1-PS4

Waves: Light and Sound

Performance Expectation 1-PS4-3

Students who demonstrate understanding can:

Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

[Clarification Statement: Examples of materials could include those that are transparent ((such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), or reflective (such as a mirror).]
[Assessment Boundary: Assessment does not include the speed of light.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**PS4.B: Electromagnetic Radiation** Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.)	**Cause and Effect** Simple tests can be designed to gather evidence to support or refute student ideas about causes.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Sound and Light Investigations Guide:

Investigation 3, Parts 1-3
Investigation 4, Parts 1-4

Sound and Light Science Resources Book:

"Playing in the Light"
"Reflections"
"Seeing the Light"
"Communicating with Light"

GRADE 1-PS4

Waves: Light and Sound

Performance Expectation 1-PS4-4

Students who demonstrate understanding can:

Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

[Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones", and a pattern of drum beats.]
[Assessment Boundary: Assessment does not include technological details for how communication devices work.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**PS4.C: Information Technologies and Instrumentation** People also use a variety of devices to communicate (send and receive information) over long distances.	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Sound and Light Investigations Guide:

Investigation 3, Parts 1-3
Investigation 4, Parts 1-4

Sound and Light Science Resources Book:

"Playing in the Light"
"Reflections"
"Seeing the Light"
"Communicating with Light"

GRADE 1-LS1

Structure, Function and Information Processing

Performance Expectation 1-LS1-1

Students who demonstrate understanding can:

Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*

[Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and detecting intruders by mimicking eyes or ears.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**LS1.A: Structure and Function** All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. **LS1.D: Information Processing** Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.	**Structure and Function** The shape and stability of structures of natural and designed objects are related to their function(s). **Influence of Engineering, Technology, and Science on Society and the Natural World** Every human-made product is designed by applying some knowledge of the natural world and is built by built using materials derived from the natural world

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Plants and Animals Investigations Guide:

Investigation 1, Parts 1-4
Investigation 2, Parts 1-4
Investigation 4, Parts 1-3

Plants and Animals Science Resources Book:

"What Do Plants Need?"
"The Story of Wheat"
"Variation"
"What Do Animals Need?"
"Plants and Animals around the World"
"Learning from Nature"
"Animals and Their Young"

GRADE 1-LS1

Structure, Function and Information Processing

Performance Expectation 1-LS1-2

Students who demonstrate understanding can:

Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

[Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) or the responses of the parents (such as feeding, comforting, and protecting the offspring).]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information **Scientific Knowledge is Based on Empirical Evidence** Scientists look for patterns and order when making observations about the world.	**LS1.B: Growth and Development of Organisms** Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.	**Patterns** Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Plants and Animals Investigations Guide:

Investigation 1, Parts 1-4
Investigation 2, Parts 1-4
Investigation 4, Parts 1-3

Plants and Animals Science Resources Book:

"What Do Plants Need?"
"The Story of Wheat"
"Variation"
"What Do Animals Need?"
"Plants and Animals around the World"
"Learning from Nature"
"Animals and Their Young"

GRADE 1-LS3

Structure, Function and Information Processing

Performance Expectation 1-LS3-1

Students who demonstrate understanding can:

Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

[Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.]

[Assessment Boundary: Assessment does not include inheritance, animals that undergo metamorphosis or hybrids.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**LS3.A: Inheritance of Traits** Young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents. **LS3.B: Variation of Traits** Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.	**Patterns** Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Plants and Animals Investigations Guide:

Investigation 1, Part 4
Investigation 3, Parts 1-4
Investigation 4, Parts 1-3

Plants and Animals Science Resources Book:

"Variation"
"What Do Animals Need?"
"Plants and Animals around the World"
"Learning from Nature"
"Animals and Their Young"

GRADE 1-ESS1

Space Systems: Patterns and Cycles

Performance Expectation 1-ESS1-1

Students who demonstrate understanding can:

Use observations of the sun, moon, and stars to describe patterns that can be predicted.

[Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars, other than our sun, are visible at night but not during the day.]
[Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data	**ESS1.A: The Universe and its Stars** Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.	**Patterns** Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** Science assumes natural events happen today as they happened in the past. Many events are repeated.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Air and Weather Investigations Guide:

Investigation 2, Parts 1-4
Investigation 4, Parts 1-3

Air and Weather Science Resources Book:

"What Is the Weather Today?"
"Clouds"
"Water in the Air"
"Changes in the Sky"
"What's the Weather?"
"Changes in the Sky"
"Seasons"
"Getting through the Winter"

GRADE 1-ESS1

Space Systems: Patterns and Cycles

Performance Expectation 1-ESS1-2

Students who demonstrate understanding can:

Make observations at different times of year to relate the amount of daylight to the time of year.

[Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.]
[Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**ESS1.B: Earth and the Solar System** Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	**Patterns** Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Air and Weather Investigations Guide:

Investigation 2, Parts 1-4
Investigation 4, Parts 1-3

Air and Weather Science Resources Book:

"What Is the Weather Today?"
"Clouds"
"Water in the Air"
"Changes in the Sky"
"What's the Weather?"
"Changes in the Sky"
"Seasons"
"Getting through the Winter"

GRADE 1-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 1-ETS1-1
Students who demonstrate understanding can: **Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems	**ETS1.A: Defining and Delimiting Engineering Problems** A situation that people want to change or create can be approached as a problem to be solved through engineering. Asking questions, making observations, and gathering information are helpful in thinking about problems. Before beginning to design a solution, it is important to clearly understand the problem.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Sound and Light Investigations Guide:

Investigation 2, Part 4
Investigation 4, Part 4

Sound and Light Science Resources Book:

"Communicating with Light"

GRADE 1-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 1-ETS1-2

Students who demonstrate understanding can:

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models	**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.	**Structure and Function** The shape and stability of structures of natural and designed objects are related to their function(s).

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Sound and Light Investigations Guide:

Investigation 2, Part 4
Investigation 4, Part 4

Sound and Light Science Resources Book:

"Communicating with Light"

GRADE 1-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 1-ETS1-3
Students who demonstrate understanding can: **Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data	**ETS1.C: Optimizing the Design Solution** Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Sound and Light Investigations Guide:

Investigation 2, Part 4
Investigation 4, Part 4

Sound and Light Science Resources Book:

"Communicating with Light"

GRADE 2-PS1

Structures and Properties of Matter

Performance Expectation 2-PS1-1

Students who demonstrate understanding can:

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

[Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**PS1.A: Structure and Properties of Matter** Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.	**Patterns** Patterns in the natural and human designed world can be observed.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Solids and Liquids Investigations Guide:

Investigation 1, Parts 1-5
Investigation 2, Parts 1-4
Investigation 3, Parts 1-5
Investigation 4, Parts 1-5

Solids and Liquids Science Resources Book:

"Everything Matters"
"Solid Objects and Materials"
"Towers"
"Bridges"
"Liquids"
"Pouring"
"Comparing Solids and Liquids"
"Mix It Up!" "Heating and Cooling"
"Is Change Reversible?"

GRADE 2-PS1

Structures and Properties of Matter

Performance Expectation 2-PS1-2

Students who demonstrate understanding can:

Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.*

[Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.]
[Assessment Boundary: Assessment of quantitative measurements is limited to length.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data	**PS1.A: Structure and Properties of Matter** Different properties are suited to different purposes.	**Cause and Effect** Simple tests can be designed to gather evidence to support or refute student ideas about causes. **Influence of Engineering, Technology, and Science on Society and the Natural World** Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Solids and Liquids Investigations Guide:

Investigation 4, Parts 1-5

Solids and Liquids Science Resources Book:

"Mix It Up!"
"Heating and Cooling"
"Is Change Reversible?"

GRADE 2-PS1

Structures and Properties of Matter

Performance Expectation 2-PS1-3

Students who demonstrate understanding can:

Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

[Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**PS1.A: Structure and Properties of Matter** Different properties are suited to different purposes. A great variety of objects can be built up from a small set of pieces.	**Energy and Matter** Objects may break into smaller pieces and be put together into larger pieces, or change shapes.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Solids and Liquids Investigations Guide:

Investigation 4, Parts 1-5

Solids and Liquids Science Resources Book:

"Mix It Up!"
"Heating and Cooling"
"Is Change Reversible?"

GRADE 2-PS1

Structures and Properties of Matter

Performance Expectation 2-PS1-4

Students who demonstrate understanding can:

Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

[Clarification Statement: Examples of reversible changes could include materials such as water or butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** Scientists search for cause and effect relationships to explain natural events.	**PS1.B: Chemical Reactions** Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.	**Cause and Effect** Events have causes that generate observable patterns.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Solids and Liquids Investigations Guide:

Investigation 4, Part 4

Solids and Liquids Science Resources Book:

"Mix It Up!"
"Heating and Cooling"
"Is Change Reversible?"

GRADE 2-LS2

Interdependent Relationships in Ecosystems

Performance Expectation 2-LS2-1

Students who demonstrate understanding can:

Plan and conduct an investigation to determine if plants need sunlight and water to grow.

[Assessment Boundary: Assessment is limited to testing one variable at a time.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**LS2.A: Interdependent Relationships in Ecosystems** Plants depend on water and light to grow.	**Cause and Effect** Events have causes that generate observable patterns.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Insects and Plants Investigations Guide:

Investigation 2, Parts 1-4

Insects and Plants Science Resources Book:

"How Seeds Travel"

GRADE 2-LS2

Interdependent Relationships in Ecosystems

Performance Expectation 2-LS2-2

Students who demonstrate understanding can:

Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models	**LS2.A: Interdependent Relationships in Ecosystems** Plants depend on animals for pollination or to move their seeds around **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.	**Structure and Function** The shape and stability of structures of natural and designed objects are related to their function(s).

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Insects and Plants Investigations Guide:

Investigation 2, Parts 1-4

Insects and Plants Science Resources Book:

"How Seeds Travel"

GRADE 2-LS4

Interdependent Relationships in Ecosystems

Performance Expectation 2-LS4-1

Students who demonstrate understanding can:

Make observations of plants and animals to compare the diversity of life in different habitats.

[Clarification Statement: Emphasis is on the diversity of living things in a variety of habitats.]
[Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations **Scientific Knowledge is Based on Empirical Evidence** Scientists look for patterns and order when making observations about the world.	**LS4.D: Biodiversity and Humans** There are many different kinds of living things in any area, and they exist in different places on land and in water.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Insects and Plants Investigations Guide:

Investigation 1, Parts 1-3
Investigation 2, Parts 1-4
Investigation 3, Parts 1-4
Investigation 4, Parts 1-4
Investigation 5, Parts 1-4

Insects and Plants Science Resources Book:

"Animals and Plants in Their Habitats"
"Flowers and Seeds"
"How Seeds Travel"
"So Many Kinds, So Many Places"
"Insect Shapes and Colors"
"Insect Life Cycles"
"Life Goes Around"

GRADE 2-ESS1

Earth's Systems: Processes that Shape the Earth

Performance Expectation 2-ESS1-1

Students who demonstrate understanding can:

Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

[Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.]
[Assessment Boundary: Assessment does not include quantitative measurements of timescales.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**ESS1.C: The History of Planet Earth** Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.	**Stability and Change** Things may change slowly or rapidly.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Pebbles, Sand, and Silt Investigations Guide:

Investigation 1, Parts 1-2
Investigation 2, Parts 3-4
Investigation 4, Part 4

Pebbles, Sand, and Silt Science Resources Book:

"Rocks Move"
"Landforms"
"Preventing Erosion"
"Land and Water on Earth"

GRADE 2-ESS2

Earth's Systems: Processes that Shape the Earth

Performance Expectation 2-ESS2-1

Students who demonstrate understanding can:

Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*

[Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**ESS2.A: Earth Materials and Systems** Wind and water can change the shape of the land. **ETS1.C: Optimizing the Design Solution** Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	**Stability and Change** Things may change slowly or rapidly. **Influence of Engineering, Technology, and Science on Society and the Natural World** Developing and using technology has impacts on the natural world. **Science Addresses Questions About the Natural and Material World** Scientists study the natural and material world.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Pebbles, Sand, and Silt Investigations Guide:

Investigation 2, Part 4
Investigation 3, Parts 1-5
Investigation 4, Parts 1-4

Pebbles, Sand, and Silt Science Resources Book:

"Landforms"
"Making Things with Rocks"
"What Are Natural Resources?"
"Where Is Water Found?"
"States of Water"
"Preventing Erosion"
"Land and Water on Earth"

GRADE 2-ESS2

Earth's Systems: Processes that Shape the Earth

Performance Expectation 2-ESS2-2

Students who demonstrate understanding can:

Develop a model to represent the shapes and kinds of land and bodies of water in an area.

[Assessment Boundary: Assessment does not include quantitative scaling in models.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models	**ESS2.B: Plate Tectonics and Large- Scale System Interactions** Maps show where things are located. One can map the shapes and kinds of land and water in any area.	**Patterns** Patterns in the natural world can be observed.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Pebbles, Sand, and Silt Investigations Guide:

Investigation 4, Part 4

Pebbles, Sand, and Silt Science Resources Book:

"Preventing Erosion"

"Land and Water on Earth"

GRADE 2-ESS2

Earth's Systems: Processes that Shape the Earth

Performance Expectation 2-ESS2-3

Students who demonstrate understanding can:

Obtain information to identify where water is found on Earth and that it can be solid or liquid.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information	**ESS2.C: The Roles of Water in Earth's Surface Processes** Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.	**Patterns** Patterns in the natural world can be observed.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Pebbles, Sand, and Silt Investigations Guide:

Investigation 2, Parts 3-4
Investigation 4, Parts 3-4

Pebbles, Sand, and Silt Science Resources Book:

"Rocks Move"
"Landforms"
"Preventing Erosion"
"Land and Water on Earth"

GRADE 2-ETS1

Engineering, Technology and Application of Science

Performance Expectation 2-ETS1-1

Students who demonstrate understanding can:

Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems	**ETS1.A: Defining and Delimiting Engineering Problems** A situation that people want to change or create can be approached as a problem to be solved through engineering. Asking questions, making observations, and gathering information are helpful in thinking about problems. Before beginning to design a solution, it is important to clearly understand the problem.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Solids and Liquids Investigations Guide:
Investigation 1, Part 4

Solids and Liquids Science Resources Book:
"Towers"
"Bridges"

Insects and Plants Investigations Guide:
Investigation 3, Part 4
Investigation 5, Part 2

Pebbles, Sand, and Silt Investigations Guide:
Investigation 3, Parts 2-5
Investigation 4, Part 2

Pebbles, Sand, and Silt Science Resources Book:
"What Are Natural Resources?"
"What Is in Soil?"
"Testing Soil"

GRADE 2-ETS1

Engineering, Technology and Application of Science

Performance Expectation 2-ETS1-2

Students who demonstrate understanding can:

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models	**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.	**Structure and Function** The shape and stability of structures of natural and designed objects are related to their function(s).

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Solids and Liquids Investigations Guide:
Investigation 1, Part 4

Solids and Liquids Science Resources Book:
"Towers"
"Bridges"

Insects and Plants Investigations Guide:
Investigation 2, Part 4
Investigation 3, Part 4
Investigation 5, Part 2

Insects and Plants Science Resources Book:
"How Seeds Travel"

Pebbles, Sand, and Silt Investigations Guide:
Investigation 3, Parts 2-5
Investigation 4, Part 2

Pebbles, Sand, and Silt Science Resources Book:
"What Are Natural Resources?"
"What Is in Soil?"
"Testing Soil"

GRADE 2-ETS1

Engineering, Technology and Application of Science

Performance Expectation 2-ETS1-3

Students who demonstrate understanding can:

Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data	**ETS1.C: Optimizing the Design Solution** Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Solids and Liquids Investigations Guide:
Investigation 1, Part 4

Solids and Liquids Science Resources Book:
"Towers"
"Bridges"

Insects and Plants Investigations Guide:
Investigation 3, Part 4

Pebbles, Sand, and Silt Investigations Guide:
Investigation 3, Parts 2-5
Investigation 4, Part 2

Pebbles, Sand, and Silt Science Resources Book:
"What Are Natural Resources?"
"What Is in Soil?"
"Testing Soil"

Arkansas Science Standards Alignment to FOSS Next Generation

GRADE 3-PS2

Forces and Interactions

Performance Expectation 3-PS2-1

Students who demonstrate understanding can:

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

[AR Clarification Statement: Examples could include an unbalanced force on one side of a box can make it start moving or balanced forces pushing on a box from both sides will not produce any motion at all.]
[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 **Scientific Investigations Use a Variety of Methods** Science investigations use a variety of methods, tools, and techniques.	**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. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) **PS2.B: Types of Interactions** Objects in contact exert forces on each other.	**Cause and Effect** Cause and effect relationships are routinely identified.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Motion and Matter Investigations Guide:

Investigation 1, Parts 1-3
Investigation 2, Parts 1-4

Motion and Matter Science Resources Book:

"Magnetism and Gravity"
"What Scientists Do"
"Change of Motion"
"Patterns of Motion"
"What Goes Around"

GRADE 3-PS2

Forces and Interactions

Performance Expectation 3-PS2-2

Students who demonstrate understanding can:

Make observations and/or 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 child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.]
[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 **Science Knowledge is Based on Empirical Evidence** Science findings are based on recognizing patterns.	**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. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)	**Patterns** Patterns of change can be used to make predictions.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Motion and Matter Investigations Guide:

Investigation 1, Parts 1-3
Investigation 2, Parts 1-4

Motion and Matter Science Resources Book:

"Magnetism and Gravity"
"What Scientists Do"
"Change of Motion"
"Patterns of Motion"
"What Goes Around"

GRADE 3-PS2

Forces and Interactions

Performance Expectation 3-PS2-3

Students who demonstrate understanding can:

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

[Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon or the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force or how the orientation of magnets affects the direction of the magnetic force.]
[Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Motion and Matter Investigations Guide:

Investigation 1, Parts 1-3

Motion and Matter Science Resources Book:

"Magnetism and Gravity"
"What Scientists Do"
"Change of Motion"

GRADE 3-PS2

Forces and Interactions

Performance Expectation 3-PS2-4

Students who demonstrate understanding can:

Define a simple design problem that can be solved by applying scientific ideas about magnets.*

[Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems	**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.	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Motion and Matter Investigations Guide:

Investigation 1, Parts 1-3

Motion and Matter Science Resources Book:

"Magnetism and Gravity"
"What Scientists Do"
"Change of Motion"

GRADE 3-LS2

Interdependent Relationships in Ecosystems

Performance Expectation 3-LS2-1

Students who demonstrate understanding can:

Construct an argument that some animals form groups that help members survive.

[AR Clarification Statement: Examples could include ant colonies, herds of bison, or hives of bees.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence	**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.	**Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Structures of Life Investigations Guide:

Investigation 3, Parts 3 and 5

Structures of Life Science Resources Book:

"Life on Earth"
"Food Chains"

GRADE 3-LS4

Interdependent Relationships in Ecosystems

Performance Expectation 3-LS4-1

Students who demonstrate understanding can:

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

[Clarification Statement: Examples of data could include type, size, and distributions of fossilized organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [Assessment Boundary: Assessment does not include identification of specific fossils or living plants and animals. Assessment is limited to major fossil types and relative ages.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data	**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. **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** Science assumes consistent patterns in natural systems.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Structures of Life Investigations Guide:

Investigation 4, Part 2

Structures of Life Science Resources Book:

"Barn Owls"
"Fossils"
"Skeletons on the Outside"
"Crayfish, Snails, and Humans"

GRADE 3-LS4

Interdependent Relationships in Ecosystems

Performance Expectation 3-LS4-3

Students who demonstrate understanding can:

Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

[AR Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other for survival.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence	**LS4.C: Adaptation** 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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Structures of Life Investigations Guide:

Investigation 3, Parts 2, 4-5

Structures of Life Science Resources Book:

"Adaptations"
"Inside a Snail's Shell"
"A Change in the Environment"
"Food Chains"

GRADE 3-LS4

Interdependent Relationships in Ecosystems

Performance Expectation 3-LS4-4

Students who demonstrate understanding can:

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.*

[Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.]
[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	**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. **LS4.D: Biodiversity and Humans** Populations live in a variety of habitats, and change in those habitats affects the organisms living there.	**Systems and System Models** A system can be described in terms of its components and their interactions. **Interdependence of Science, Engineering, and Technology** Knowledge of relevant scientific concepts and research findings is important in engineering.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Structures of Life Investigations Guide:

Investigation 3, Parts 2, 4-5

Structures of Life Science Resources Book:

"Adaptations"
"Inside a Snail's Shell"
"A Change in the Environment"
"Food Chains"

GRADE 3-LS1

Inheritance and Variation of Traits: Life Cycle and Traits

Performance Expectation 3-LS1-1

Students who demonstrate understanding can:

Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

[Clarification Statement: Changes organisms go through during their life form a pattern.]
[Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Scientific Knowledge is Based on Empirical Evidence** Science findings are based on recognizing patterns.	**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. **LS4.B: Natural Selection** Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.	**Patterns** Patterns of change can be used to make predictions.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Structures of Life Investigations Guide:

Investigation 1, Parts 1-3
Investigation 2, Parts 1-3

Structures of Life Science Resources Book:

"The Reason for Fruit"
"The Most Important Seed"
"Barbara McClintock"
"Nature Journal"
"How Seeds Travel"
"Germination"
"Life Cycles"

GRADE 3-LS3

Inheritance and Variation of Traits: Life Cycle and Traits

Performance Expectation 3-LS3-1

Students who demonstrate understanding can:

Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

[Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.]
[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	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Structures of Life Investigations Guide:

Investigation 1, Part 3
Investigation 2, Parts 2-3
Investigation 3, Part 2
Investigation 4, Parts 1-2

Structures of Life Science Resources Book:

"Barbara McClintock"
"Life Cycles"
"Adaptations"
"The Human Skeleton"
"Barn Owls"
"Fossils"
"Skeletons on the Outside"
"Crayfish, Snails, and Humans"

GRADE 3-LS3

Inheritance and Variation of Traits: Life Cycle and Traits

Performance Expectation 3-LS3-2

Students who demonstrate understanding can:

Use evidence to support the explanation that traits can be influenced by the environment.

[Clarification Statement: Examples of the environment affecting a trait could include insufficient water stunting normally tall plants; and, a pet dog becoming overweight that is given too much food and too little exercise.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**LS3.A: Inheritance of Traits** Other 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 also affects the traits that an organism develops.	**Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Structures of Life Investigations Guide:

Investigation 1, Part 3
Investigation 2, Parts 2-3
Investigation 3, Part 2
Investigation 4, Parts 1-2

Structures of Life Science Resources Book:

"Barbara McClintock"
"Life Cycles"
"Adaptations"
"The Human Skeleton"
"Barn Owls"
"Fossils"
"Skeletons on the Outside"
"Crayfish, Snails, and Humans"

GRADE 3-LS4

Inheritance and Variation of Traits: Life Cycle and Traits

Performance Expectation 3-LS4-2

Students who demonstrate understanding can:

Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

[AR Clarification Statement: Examples of cause and effect relationships could be plants of the same species with larger thorns may be less likely to be eaten; and, animals of the same species with more effective camouflage or coloration may be more likely to survive and produce offspring.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Structures of Life Investigations Guide:

Investigation 3, Parts 2 and 5

Structures of Life Science Resources Book:

"Adaptations"
"Food Chains"

GRADE 3-ESS2

Weather and Climate

Performance Expectation 3-ESS2-1

Students who demonstrate understanding can:

Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

[Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.]
[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	**ESS2.D: Weather and Climate** 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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Water and Climate Investigations Guide:

Investigation 4, Parts 1-3

Water and Climate Science Resources Book:

"Climate Regions"
"Wetlands for Flood Control"
"Conserving Water during Droughts"

GRADE 3-ESS2

Weather and Climate

Performance Expectation 3-ESS2-2

Students who demonstrate understanding can:

Obtain and combine information to describe climates in different regions of the world.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information	**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** Patterns of change can be used to make predictions.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Water and Climate Investigations Guide:

Investigation 2, Parts 1-5
Investigation 3, Parts 1-5
Investigation 4, Parts 1-3

Water and Climate Science Resources Book:

"Vacation Aggravation"
"Celsius and Fahrenheit"
"Water: Hot and Cold"
"Studying Weather"
"Drying Up"
"Surface-Area Experiment"
"Climate Regions"
"Wetlands for Flood Control"
"Conserving Water during Droughts"

GRADE 3-ESS3

Weather and Climate

Performance Expectation 3-ESS3-1

Students who demonstrate understanding can:

Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.*

[Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence	**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.	**Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change. **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). **Science is a Human Endeavor** Science affects everyday life.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Water and Climate Investigations Guide:

Investigation 4, Parts 1-3
Investigation 5, Parts 1-3

Water and Climate Science Resources Book:

"Climate Regions"
"Wetlands for Flood Control"
"Conserving Water during Droughts"
"Water: A Vital Resource"
"Natural Resources"
"Ellen Swallow Richards: An Early Ecologist"
"Making Drinking Water Safe"
"Using the Energy of Water"

GRADE 3-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 3-ETS1-1

Students who demonstrate understanding can:

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems	**ETS1.A: Defining and Delimiting Engineering Problems** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	**Influence of Science, Engineering, and Technology on Society and the Natural World** People's needs and wants change over time, as do their demands for new and improved technologies.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Motion and Matter Investigations Guide:

Investigation 3, Parts 1-4

Motion and Matter Science Resources Book:

"What Engineers Do"
"Science Practices"
"Engineering Practices"
"Soap Box Derby"
"The Metric System"
"How Engineers and Scientists Work Together"
"Magnets at Work"

GRADE 3-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 3-ETS1-2

Students who demonstrate understanding can:

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**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. At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	**Influence of Science, Engineering, and Technology on Society and the Natural World** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Motion and Matter Investigations Guide:

Investigation 3, Parts 1-4

Motion and Matter Science Resources Book:

"What Engineers Do"
"Science Practices"
"Engineering Practices"
"Soap Box Derby"
"The Metric System"
"How Engineers and Scientists Work Together"
"Magnets at Work"

GRADE 3-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 3-ETS1-3
Students who demonstrate understanding can: **Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**ETS1.B: Developing Possible Solutions** Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. **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.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Motion and Matter Investigations Guide:

Investigation 3, Parts 1-4

Motion and Matter Science Resources Book:

"What Engineers Do"
"Science Practices"
"Engineering Practices"
"Soap Box Derby"
"The Metric System"
"How Engineers and Scientists Work Together"
"Magnets at Work"

Arkansas Science Standards Alignment to FOSS Next Generation

GRADE 4-PS4

Structure, Function and Information Processing

Performance Expectation 4-PS4-2

Students who demonstrate understanding can:

Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

[Assessment Boundary: Assessment does not include knowledge of specific colors reflected or seen, the cellular mechanisms of vision, or how the retina works.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling	**PS4.B: Electromagnetic Radiation** An object can be seen when light reflected from its surface enters the eyes.	**Cause and Effect** Cause and effect relationships are routinely identified.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 5, Parts 1-3

Energy Science Resources Book:

"Waves"
"More about Sound"
"Light Interactions"
"Throw a Little Light on Sight"
"More about Light on the Subject"
"Alternative Sources of Electricity"
"Ms. Osgood's Class Report"

GRADE 4-LS1

Structure, Function and Information Processing

Performance Expectation 4-LS1-1

Students who demonstrate understanding can:

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

[AR Clarification Statement: Examples of structures for survival could include thorns and teeth. Examples of structures for growth could include stems and the skeleton. Examples of structures for behavior could include roots and the brain. Examples of reproduction could include pistils, stamens, and eggs.]
[Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence	**LS1.A: Structure and Function** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	**Systems and System Models** A system can be described in terms of its components and their interactions.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Environments Investigations Guide:

Investigation 1, Parts 1-3
Investigation 2, Parts 1-4

Environments Science Resources Book:

"Two Terrestrial Environments"
"Darkling Beetles"
"Setting Up a Terrarium"
"Isopods"
"Amazon Rainforest Journal"
"Freshwater Environments"
"What Is an Ecosystem?"
"Food Chains and Food Webs"
"Human Activities and Aquatic Environments"
"Comparing Aquatic and Terrestrial Environments"
"Animal Sensory Systems"
"Saving Murrelets through Mimicry"

GRADE 4-LS1

Structure, Function and Information Processing

Performance Expectation 4-LS1-2

Students who demonstrate understanding can:

Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

[Clarification Statement: Emphasis is on systems of information transfer. Use of models could include diagrams, computer simulations, and physical models.]
[Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling	**LS1.D: Information Processing** Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions	**Systems and System Models** A system can be described in terms of its components and their interactions.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Environments Investigations Guide:

Investigation 1, Parts 1-3
Investigation 2, Parts 1-4

Environments Science Resources Book:

"Two Terrestrial Environments"
"Darkling Beetles"
"Setting Up a Terrarium"
"Isopods"
"Amazon Rainforest Journal"
"Freshwater Environments"
"What Is an Ecosystem?"
"Food Chains and Food Webs"
"Human Activities and Aquatic Environments"
"Comparing Aquatic and Terrestrial Environments"
"Animal Sensory Systems"
"Saving Murrelets through Mimicry"

GRADE 4-PS4

Waves: Waves and Information

Performance Expectation 4-PS4-1

Students who demonstrate understanding can:

Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

[Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.]

[Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Scientific Knowledge is Based on Empirical Evidence** Science findings are based on recognizing patterns.	**PS4.A: Wave Properties** Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).	**Patterns** Similarities and differences in patterns can be used to sort and classify natural phenomena.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 5, Parts 1-3

Energy Science Resources Book:

"Waves"
"More about Sound"
"Light Interactions"
"Throw a Little Light on Sight"
"More about Light on the Subject"
"Alternative Sources of Electricity"
"Ms. Osgood's Class Report"

GRADE 4-PS4

Waves: Waves and Information

Performance Expectation 4-PS4-3

Students who demonstrate understanding can:

Generate and compare multiple solutions that use patterns to transfer information.*

[Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1s and 0s representing black and white to send information about a picture, or using Morse code to send text.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**PS4.C: Information Technologies and Instrumentation** Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. **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.	**Patterns** Similarities and differences in patterns can be used to sort and classify designed products. **Interdependence of Science, Engineering, and Technology** Knowledge of relevant scientific concepts and research findings is important in engineering.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 5, Parts 1-3

Energy Science Resources Book:

"Waves"
"More about Sound"
"Light Interactions"
"Throw a Little Light on Sight"
"More about Light on the Subject"
"Alternative Sources of Electricity"
"Ms. Osgood's Class Report"

GRADE 4-PS3

Energy

Performance Expectation 4-PS3-1

Students who demonstrate understanding can:

Use evidence to construct an explanation relating the speed of an object to the energy of that object.

[Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**PS3.A: Definitions of Energy** The faster a given object is moving, the more energy it possesses.	**Energy and Matter** Energy can be transferred in various ways and between objects.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 4, Parts 1-3

Energy Science Resources Book:

"Energy"
"What Causes Change of Motion?"
"Bowling"
"Force and Energy"
"Potential and Kinetic Energy at Work"

GRADE 4-PS3

Energy

Performance Expectation 4-PS3-2

Students who demonstrate understanding can:

Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

[Assessment Boundary: Assessment does not include quantitative measurements of energy.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**PS3.A: Definitions of Energy** Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **PS3.B: Conservation of Energy and Energy Transfer** Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. Light also transfers energy from place to place. Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.	**Energy and Matter** Energy can be transferred in various ways and between objects.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 1, Parts 1-4
Investigation 3, Parts 1-3
Investigation 4, Parts 1-3
Investigation 5, Parts 1-3

Energy Science Resources Book:

"Edison Sees the Light"
"Energy Sources"
"Science Practices"
"Engineering Practices"
"Thinking Like an Engineer"
"Engineering a Solar Lighting Solution"
"Electricity Creates Magnetism"
"Using Magnetic Fields"
"Electromagnets Everywhere"
"Morse Gets Clicking"
"Energy"
"What Causes Change of Motion?"
"Bowling"
"Force and Energy"
"Potential and Kinetic Energy at Work"

GRADE 4-PS3

Energy

Performance Expectation 4-PS3-3

Students who demonstrate understanding can:

Ask questions and predict outcomes about the changes in energy that occur when objects collide.

[Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.]
[Assessment Boundary: Assessment does not include quantitative measurements of energy.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems	**PS3.A: Definitions of Energy** Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **PS3.B: Conservation of Energy and Energy Transfer** Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. **PS3.C: Relationship Between Energy and Forces** When objects collide, the contact forces transfer energy so as to change the objects' motions.	**Energy and Matter** Energy can be transferred in various ways and between objects.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 4, Parts 1-3

Energy Science Resources Book:

"Energy"
"What Causes Change of Motion?"
"Bowling"
"Force and Energy"
"Potential and Kinetic Energy at Work"

GRADE 4-PS3

Energy

Performance Expectation 4-PS3-4

Students who demonstrate understanding can:

Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*

[Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion, light, or sound energy; or, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, and time to design the device.]

[Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**PS3.B: Conservation of Energy and Energy Transfer** Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. **PS3.D: Energy in Chemical Processes and Everyday Life** The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. **ETS1.A: Defining Engineering Problems** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	**Energy and Matter** Energy can be transferred in various ways and between objects. **Influence of Engineering, Technology, and Science on Society and the Natural World** Engineers improve existing technologies or develop new ones. **Connections to Nature of Science** **Science is a Human Endeavor** Most scientists and engineers work in teams. Science affects everyday life.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 1, Parts 1-4
Investigation 2, Parts 1-3
Investigation 3, Parts 1-3
Investigation 5, Parts 1-3

Energy Science Resources Book:

"Edison Sees the Light"
"Energy Sources"
"Series and Parallel Circuits"
"Science Practices"
"Engineering Practices"
"Thinking Like an Engineer"
"Engineering a Solar Lighting Solution"
"When Magnet Meets Magnet"
"Magnificent Magnetic Models"
"Make a Magnetic Compass"
"Electricity Creates Magnetism"
"Using Magnetic Fields"
"Electromagnets Everywhere"
"Morse Gets Clicking" "Waves"
"More about Sound"
"Light Interactions"
"Throw a Little Light on Sight"
"More Light on the Subject"
"Alternative Sources of Energy"
"Ms. Osgood's Class Report"

GRADE 4-ESS3

Energy

Performance Expectation 4-ESS3-1

Students who demonstrate understanding can:

Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

[Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, or sunlight; non-renewable energy resources are fossil fuels or fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from the burning of fossil fuels.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information	**ESS3.A: Natural Resources** Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.	**Cause and Effect** Cause and effect relationships are routinely identified and used to explain change. **Interdependence of Science, Engineering, and Technology** Knowledge of relevant scientific concepts and research findings is important in engineering.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Environments Investigations Guide:

Investigation 3, Parts 1-4

Environments Science Resources Book:

"Brine Shrimp"
"The Mono Lake Story"
"What Happens When Ecosystems Change?"
"The Shrimp Club"
"Variation and Selection"

GRADE 4-ESS1

Earth's Systems: Processes that Shape the Earth

Performance Expectation [4-ESS1-1; 4-ESS2-1; 4-ESS2-2; 4-ESS3-2]

Students who demonstrate understanding can:

Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

[Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.]
[Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**ESS1.C: The History of Planet Earth** Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. **ETS1.B: Designing Solutions to Engineering Problems** Testing a solution involves investigating how well it performs under a range of likely conditions.	**Patterns** Patterns can be used as evidence to support an explanation. **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** Science assumes consistent patterns in natural systems.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Soils, Rocks, and Landforms Investigations Guide:

Investigation 2, Parts 1-4

Soils, Rocks, and Landforms Science Resources Book:

"Erosion and Deposition"
"Landforms Photo Album"
"Fossils Tell a Story"
"Pieces of a Dinosaur Puzzle"

GRADE 4-ESS2

Earth's Systems: Processes that Shape the Earth

Performance Expectation 4-ESS2-1

Students who demonstrate understanding can:

Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

[Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, or volume of water flow.]

[Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**ESS2.A: Earth Materials and Systems** Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. **ESS2.E: Biogeology** Living things affect the physical characteristics of their regions. **ETS1.B: Designing Solutions to Engineering Problems** Testing a solution involves investigating how well it performs under a range of likely conditions.	**Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Soils, Rocks, and Landforms Investigations Guide:

Investigation 1, Parts 1-4
Investigation 2, Parts 1-4

Soils, Rocks, and Landforms Science Resources Book:

"What Is Soil?"
"Weathering"
"Erosion and Deposition"
"Landforms Photo Album"
"Fossils Tell a Story"
"Pieces of a Dinosaur Puzzle"

GRADE 4-ESS2

Earth's Systems: Processes that Shape the Earth

Performance Expectation 4-ESS2-2

Students who demonstrate understanding can:

Analyze and interpret data from maps to describe patterns of Earth's features.

[Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data	**ESS2.B: Plate Tectonics and Large-Scale System Interactions** The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. **ETS1.B: Designing Solutions to Engineering Problems** Testing a solution involves investigating how well it performs under a range of likely conditions.	**Patterns** Patterns can be used as evidence to support an explanation.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Soils, Rocks, and Landforms Investigations Guide:

Investigation 2, Parts 1-4
Investigation 3, Parts 1-4

Soils, Rocks, and Landforms Science Resources Book:

"Erosion and Deposition"
"Landforms Photo Album"
"Fossils Tell a Story"
"Pieces of a Dinosaur Puzzle"
"Topographic Maps"
"The Story of Mount Shasta"
"It Happened So Fast!"

GRADE 4-ESS3

Earth's Systems: Processes that Shape the Earth

Performance Expectation 4-ESS3-2

Students who demonstrate understanding can:

Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*

[Clarification Statement: Examples of solutions could include designing an earthquake resistant building or improving monitoring of volcanic activity.]

[Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**ESS3.B: Natural Hazards** A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. **ETS1.B: Designing Solutions to Engineering Problems** Testing a solution involves investigating how well it performs under a range of likely conditions.	**Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change. **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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Soils, Rocks, and Landforms Investigations Guide:

Investigation 2, Parts 1-4
Investigation 3, Parts 1-4

Soils, Rocks, and Landforms Science Resources Book:

"Erosion and Deposition"
"Landforms Photo Album"
"Fossils Tell a Story"
"Pieces of a Dinosaur Puzzle"
"Topographic Maps"
"The Story of Mount Shasta"
"It Happened So Fast!"

GRADE 4-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 4-ETS1-1

Students who demonstrate understanding can:

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems	**ETS1.A: Defining and Delimiting Engineering Problems** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	**Influence of Science, Engineering, and Technology on Society and the Natural World** People's needs and wants change over time, as do their demands for new and improved technologies.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 1, Part 4
Investigation 5, Part 3

Energy Science Resources Book: "Science Practices"

"Engineering Practices"
"Thinking Like an Engineer"
"Engineering a Solar Lighting Solution"
"Alternative Sources of Electricity"
"Ms. Osgood's Class Report"

GRADE 4-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 4-ETS1-2
Students who demonstrate understanding can: **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solution	**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. At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	**Influence of Science, Engineering, and Technology on Society and the Natural World** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 1, Part 4
Investigation 5, Part 3

Energy Science Resources Book:

"Science Practices"
"Engineering Practices"
"Thinking Like an Engineer"
"Engineering a Solar Lighting Solution"
"Alternative Sources of Electricity"
"Ms. Osgood's Class Report"

GRADE 4-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 4-ETS1-3

Students who demonstrate understanding can:

Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**ETS1.B: Developing Possible Solutions** Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. **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.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Energy Investigations Guide:

Investigation 1, Part 4
Investigation 3, Parts 1-3
Investigation 5, Part 3

Energy Science Resources Book:

"Science Practices"
"Engineering Practices"
"Thinking Like an Engineer"
"Engineering a Solar Lighting Solution"
"Electricity Creates Magnetism"
"Using Magnetic Fields"
"Electromagnets Everywhere"
"Morse Gets Clicking"
"Alternative Sources of Electricity"
"Ms. Osgood's Class Report"

Arkansas Science Standards Alignment to FOSS Next Generation

GRADE 5-ESS2

Earth's Systems

Performance Expectation 5-ESS2-1

Students who demonstrate understanding can:

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; or the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.]
[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	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Earth and Sun Investigations Guide:

Investigation 3, Parts 1-3
Investigation 4, Parts 1-4

Earth and Sun Science Resources Book:

"What is Air?"
"Earth's Atmosphere"
"Weather Instruments"
"Uneven Heating"
"Heating the Air: Radiation and Conduction"
"Wind and Convection"
"Wind Power"
"Wind and Convection"
"Solar Technology"

GRADE 5-ESS2

Earth's Systems

Performance Expectation 5-ESS2-2

Students who demonstrate understanding can:

Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

[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	**ESS2.C: The Roles of Water in Earth's Surface Processes** Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight, and volume.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Earth and Sun Investigations Guide:

Investigation 5: Parts 1- 3

Earth ad Sun Science Resources Book:

"Condensation"
"Where is Earth's Water?"
"The Water Cycle"

GRADE 5-ESS3

Earth's Systems

Performance Expectation 5-ESS3-1

Students who demonstrate understanding can:

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information	**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.	**Systems and System Models** A system can be described in terms of its components and their interactions. **Science Addresses Questions About the Natural and Material World** Science findings are limited to questions that can be answered with empirical evidence.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Earth and Sun Investigations Guide:

Investigation 4, Parts 1-4
Investigation 5, Parts 1-4

Earth and Sun Science Resources Book:

"Uneven Heating"
"Heating the Air: Radiation and Conduction"
"Wind and Convection"
"Wind Power"
"Solar Technology"
"Condensation"
"Where Is Earth's Water?"
"The Water Cycle"
"Severe Weather"
"Earth's Climates"
"Global Climate Change"

GRADE 5-PS2

Space Systems

Performance Expectation 5-PS2-1

Students who demonstrate understanding can:

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.]
[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	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Earth and Sun Investigations Guide:

Investigation 2, Parts 1-5

GRADE 5-ESS1

Space Systems

Performance Expectation 5-ESS1-1

Students who demonstrate understanding can:

Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.

[Assessment Boundary: Assessment is limited to relative distances rather than sizes of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, or stage).]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Earth and Sun Investigations Guide:

Investigation 1, Parts 1-3
Investigation 2, Parts 1-5

Earth and Sun Science Resources Book:

"The Night Sky"
"Looking through Telescopes"
"Comparing the Size of Earth and the Moon"
"Apollo 11 Space Mission"
"How Did Earth's Moon Form?"
"Changing Moon"
"Lunar Cycle"
"Eclipse"
"Exploring the Solar System"
"Planets of the Solar System"
"Why Doesn't Earth Fly Off into Space?"
"Stargazing"
"Star Scientists"
"Our Galaxy"
"Changing Shadows"
"Sunrise and Sunset"

GRADE 5-ESS1

Space Systems

Performance Expectation 5-ESS1-2

Students who demonstrate understanding can:

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: Examples of patterns could include the position and motion of Earth with respect to the sun and select stars that are visible only in particular months]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Earth and Sun Investigations Guide:

Investigation 1, Parts 1-3
Investigation 2, Parts 1-5

Earth and Sun Science Resources Book:

"The Night Sky"
"Looking through Telescopes"
"Comparing the Size of Earth and the Moon"
"Apollo 11 Space Mission"
"How Did Earth's Moon Form?"
"Changing Moon"
"Lunar Cycle"
"Eclipse"
"Exploring the Solar System"
"Planets of the Solar System"
"Why Doesn't Earth Fly Off into Space?"
"Stargazing"
"Star Scientists"
"Our Galaxy"
"Changing Shadows"
"Sunrise and Sunset"

GRADE 5-PS1

Structure and Properties of Matter

Performance Expectation 5-PS1-1

Students who demonstrate understanding can:

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, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.]
[Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models	**PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including 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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Mixtures and Solutions Investigations Guide

Investigation 1, Parts 1-4
Investigation 2, Parts 1-3
Investigation 3, Parts 1-4
Investigation 4, Parts 1-4
Investigation 5, Parts 1-3

Mixtures and Solutions Science Resources Book:

"Mixtures"
"Taking Mixtures Apart"
"Science Practices"
Engineering Practices"
"Extracts"
"The Story of Salt"
"Beachcombing Science"
"Solid to Liquid"
"Liquid and Gas Changes"
"Celsius and Fahrenheit"
"Solutions Up Close"
"Concentrated Solutions"
"The Air"
"Famous Scientists"
"Carbon Dioxide Concentration in the Air"
"The Frog Story"
"The Bends"
"A Sweet Solution"
"Sour Power"
"East Bay Academy for Young Scientists"
"Drinking Ocean Water"
"Creative Solutions"
"Ask a Chemist"
"When Substances Change"
"Air Bags"

GRADE 5-PS1

Structure and Properties of Matter

Performance Expectation 5-PS1-2

Students who demonstrate understanding can:

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

[AR Clarification Statement: Examples could include chemical reactions that form new substances or physical changes including phase changes, dissolving, and mixing.]
[AR Assessment Boundary: Assessment does not include distinguishing mass from weight or reactions that involve gases.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking	**PS1.A: Structure and Properties of Matter** The amount (weight) 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 of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.)	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** Science assumes consistent patterns in natural systems.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Mixtures and Solutions Investigations Guide

Investigation 1, Parts 1-4
Investigation 2, Parts 1-3
Investigation 3, Parts 1-4
Investigation 4, Parts 1-4
Investigation 5, Parts 1-3

Mixtures and Solutions Science Resources Book:

"Mixtures"
"Taking Mixtures Apart"
"Science Practices"
Engineering Practices"
"Extracts"
"The Story of Salt"
"Beachcombing Science"
"Solid to Liquid"
"Liquid and Gas Changes"
"Celsius and Fahrenheit"
"Solutions Up Close"
"Concentrated Solutions"
"The Air"
"Famous Scientists"
"Carbon Dioxide Concentration in the Air"
"The Frog Story"
"The Bends"
"A Sweet Solution"
"Sour Power"
"East Bay Academy for Young Scientists"
"Drinking Ocean Water"
"Creative Solutions"
"Ask a Chemist"
"When Substances Change"
"Air Bags"

GRADE 5-PS1

Structure and Properties of Matter

Performance Expectation 5-PS1-3

Students who demonstrate understanding can:

Make observations and measurements to identify materials based on their properties.

[Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.]
[Assessment Boundary: Assessment does not include density or distinguishing mass from weight.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**PS1.A: Structure and Properties of Matter** Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.)	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Mixtures and Solutions Investigations Guide:

Investigation 4, Parts 1-4
Investigation 5, Parts 1-3

Mixtures and Solutions Science Resources Book:

"The Bends"
"A Sweet Solution"
"Sour Power"
"East Bay Academy for Young Scientists"
"Drinking Ocean Water"
"Creative Solutions"
"Ask a Chemist"
"When Substances Change"
"Air Bags"

GRADE 5-PS1

Structure and Properties of Matter

Performance Expectation 5-PS1-4

Students who demonstrate understanding can:

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

[AR Clarification Statement: Examples of qualitative evidence could include temperature change, color change, odor change, and the formation of a gas to determine if a new substance has formed.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Mixtures and Solutions Investigations Guide:

Investigation 5, Parts 1-3

Mixtures and Solutions Science Resources Book:

"Ask a Chemist"
"When Substances Change"
"Air Bags"

GRADE 5-PS3

Matter and Energy in Organisms and Ecosystems

Performance Expectation 5-PS3-1

Students who demonstrate understanding can:

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 diagrams and flow charts.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models	**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.	**Energy and Matter** Energy can be transferred in various ways and between objects.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Living Systems Investigations Guide:

Investigation 1, Parts 1-4
Investigation 2, Parts 1-3
Investigation 3, Parts 1-3
Investigation 4, Parts 1-4

Living Systems Science Resources Book:

"Introduction to Systems"
"Is Earth a System?"
"The Biosphere"
"Monterey Bay National Marine Sanctuary"
"Comparing Aquatic and Terrestrial Ecosystems"
"There's Yeast in My Bread!"
"Producers"
"Getting Nutrients"
"The Human Digestive System"
"Leaf Classification"
"Plant Vascular Systems"
"The Story of Maple Syrup"
"The Human Circulatory System"
"The Human Respiratory System"
"Other Circulatory and Respiratory Systems"
"Structures of the Brain"
"Sensory Systems"
"Animal Communication"
"Monarch Migration"
"North Atlantic Ocean Ecosystem"

GRADE 5-LS1

Matter and Energy in Organisms and Ecosystems

Performance Expectation 5-LS1-1

Students who demonstrate understanding can:

Support an argument that plants get the materials they need for growth chiefly from air and water.

[Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence	**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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Living Systems Investigations Guide:

Investigation 2, Parts 1-3
Investigation 3, Parts 1-3

Living Systems Science Resources Book:

"There's Yeast in My Bread!"
"Producers"
"Getting Nutrients"
"The Human Digestive System"
"Leaf Classification"
"Plant Vascular Systems"
"The Story of Maple Syrup"
"The Human Circulatory System"
"The Human Respiratory System"
"Other Circulatory and Respiratory Systems"

GRADE 5-LS2

Matter and Energy in Organisms and Ecosystems

Performance Expectation 5-LS2-1

Students who demonstrate understanding can:

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 (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.] [Assessment Boundary: Assessment does not include molecular explanations.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**	**LS2.A: Interdependent Relationships in Ecosystems** The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. **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.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Living Systems Investigations Guide:
- Investigation 1, Parts 1-4
- Investigation 2, Parts 1-3
- Investigation 3, Parts 1-3
- Investigation 4, Parts 1-4

Living Systems Science Resources Book:
- "Introduction to Systems"
- "Is Earth a System?"
- "The Biosphere"
- "Monterey Bay National Marine Sanctuary"
- "Comparing Aquatic and Terrestrial Ecosystems"
- "There's Yeast in My Bread!"
- "Producers"
- "Getting Nutrients"
- "The Human Digestive System"
- "Leaf Classification"
- "Plant Vascular Systems"
- "The Story of Maple Syrup"
- "The Human Circulatory System"
- "The Human Respiratory System"
- "Other Circulatory and Respiratory Systems"
- "Structures of the Brain"
- "Sensory Systems"
- "Animal Communication"
- "Monarch Migration"
- "North Atlantic Ocean Ecosystem"

GRADE 5-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 5-ETS1-1

Students who demonstrate understanding can:

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems	**ETS1.A: Defining and Delimiting Engineering Problems** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	**Influence of Science, Engineering, and Technology on Society and the Natural World** People's needs and wants change over time, as do their demands for new and improved technologies.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Mixtures and Solutions Investigations Guide:

Investigation 1, Part 3
Investigation 4, Part 4

Mixtures and Solutions Science Resources Book:

"Taking Mixtures Apart"
"Science Practices"
"Engineering Practices"
"East Bay Academy for Young Scientists"
"Drinking Ocean Water"
"Creative Solutions"

GRADE 5-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 5-ETS1-2

Students who demonstrate understanding can:

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions	**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. At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	**Influence of Science, Engineering, and Technology on Society and the Natural World** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Mixtures and Solutions Investigations Guide:

Investigation 1, Part 3
Investigation 4, Part 4

Mixtures and Solutions Science Resources Book:

"Taking Mixtures Apart"
"Science Practices"
"Engineering Practices"
"East Bay Academy for Young Scientists"
"Drinking Ocean Water"
"Creative Solutions"

GRADE 5-ETS1

Engineering, Technology and Applications of Science

Performance Expectation 5-ETS1-3

Students who demonstrate understanding can:

Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	**ETS1.B: Developing Possible Solutions** Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. **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.	

PROGRAM REFERENCES

The following **FOSS** elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below.

Mixtures and Solutions Investigations Guide:

Investigation 1, Part 3

Mixtures and Solutions Science Resources Book:

"Taking Mixtures Apart"
"Science Practices"
"Engineering Practices"