A Correlation of

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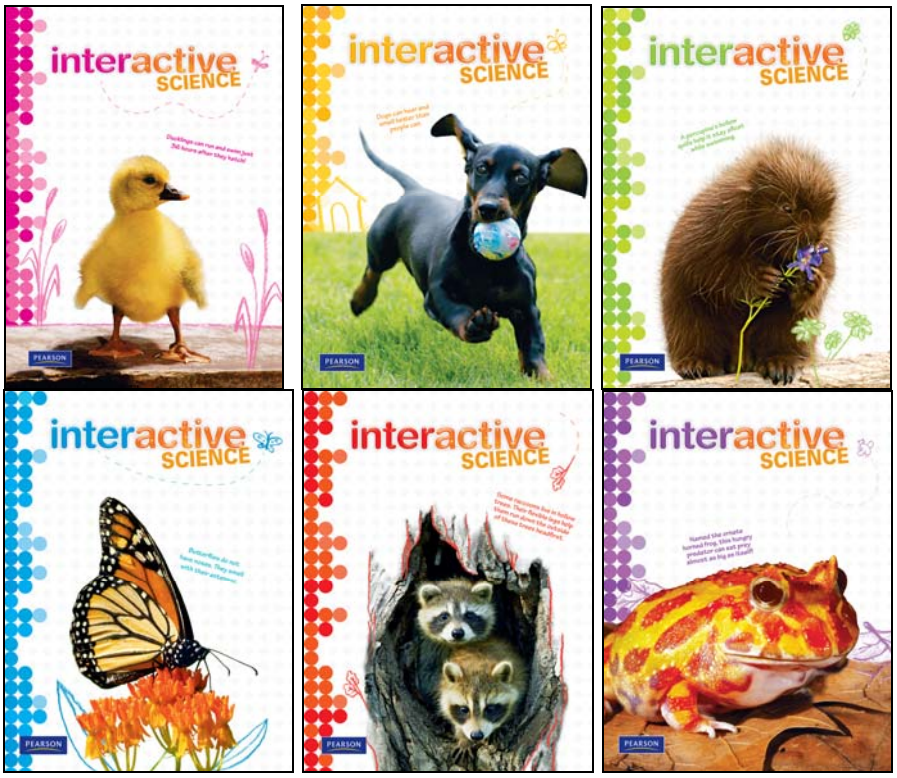
Interactive Science
Grades K-5, ©2012



To the

Next Generation Science Standards
May, 2013

Grades K-5

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to the Next Generation Science Standards, May 2013
Grades K-5

Dear Educator,

As we embark upon a new and exciting science journey, Pearson is committed to offering its complete support as classrooms implement the new Next Generation Science Standards (NGSS). Ready-to-use solutions for today and a forward-thinking plan for tomorrow connect teacher education and development, curriculum content and instruction, assessment, and information and school design and improvement. We'll be here every step of the way to provide the easiest possible transition to the NGSS with a coherent, phased approach to implementation.

Pearson has long-standing relationships with contributors and authors who have been involved with the development and review of the Next Generation Science Frameworks and subsequent Next Generation Science Standards. As such, the spirit and pedagogical approach of the NGSS initiative is embedded in all of our programs, such as ***Interactive Science.***

The planning and development of Pearson's ***Interactive Science*** was informed by the same foundational research as the NGSS Framework. Specifically, our development teams used Project 2061, the National Science Education Standards (1996) developed by the National Research Council, as well as the Science Anchors Project 2009 developed by the National Science Teachers Association to inform the development of this program. As a result, students make connections throughout the program to concepts that cross disciplines, practice science and engineering skills, and build on their foundational knowledge of key science ideas.

Interactive Science is an elementary science program that makes learning personal, engaging, and relevant for today's student. ***Interactive Science*** features an innovative Write-in Student Edition that enables students to become active participants in their learning and truly connect the Big Ideas of science to their world.

Interactive Science features a wealth of diagnostic, formative, and standardized assessment tools for teachers; Got It? Self-assessment checks, Chapter Study Guides, Chapter Review and Benchmark Practice, Examview Assessment Suite, and SuccessTracker. These ongoing assessment resources help teachers diagnose, remediate, and assess students' progress.

The following document demonstrates how ***Interactive Science,* ©2012, Grades K-5,** supports the Next Generation Science Standards (NGSS). Correlation references are to the Student Edition, Teacher Edition, Teacher's Program Guide, and *STEM Activity Books*. Please note that the Kindergarten Student Edition text pages are two-sided; each singular page contains a corresponding Activity Page on the reverse side.

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Grade K

KINDERGARTEN

K-PS2 Motion and Stability: Forces and Interactions

K-PS2 Motion and Stability: Forces and interactions

Students who demonstrate understanding can:

K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

INTERACTIVE SCIENCE: Students **investigate** pushes and pulls on SE page 19/TE page 56 and on SE page 82/TE pages 230-231. Students **compare** the effects of pushes and pulls of different force on SE page 85/TE pages 236, 240-241**.**

K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.* [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

INTERACTIVE SCIENCE: Students **discuss** position and motion of an object on SE page 86/TE page 237. They **draw** a plan for a slide and share their plans on the SE page 86 Activity/TE page 238.

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

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)

SE: 82, 85, 86
TE: 230-231, 236-237, 240-241

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2)

SE: 82, 85, 86
TE: 230-231, 236-237, 240-241

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Science uses different ways to study the world. (K-PS2-1)

SE: 82, 85, 86
TE: 230-231, 236-237, 240-241

Disciplinary Core Ideas

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions. (K-PS2-1),(K-PS2-2)

SE: 19, 82, 85-86
TE: 56, 230-231, 236-237, 240-241

- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1),(K-PS2-2)

SE: 82, 85, 86
TE: 230-231, 236-237, 240-241

PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion. (K-PS2-1)

TE: 240

PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow down more quickly. (secondary to K-PS2-1)

SE: 82, 85, 86
TE: 230-231, 236-237, 240-241

ETS1.A: Defining Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (secondary to K-PS2-2)

SE: 86
TE: 236, 240-241

Crosscutting Concepts

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1),(K-PS2-2)

SE: 82, 85, 86
TE: 230-231, 236-237, 240-241

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Grade K

K-PS3 Energy

K-PS3 Energy

Students who demonstrate understanding can:

K-PS3-1. 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.]

INTERACTIVE SCIENCE: Students **gain information** about the sun in Chapter 5, "Earth and Sky," SE pages 49-50/TE pages 140-143. In Lesson 5, "What Are Some Kinds of Weather?", SE pages 51-52/TE pages 146-147, students **describe** weather. In 21st Century Learning, TE page 146, students **observe** the weather of the day and **discuss** its affects on their choice of clothing.

K-PS3-2. Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.* [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]

INTERACTIVE SCIENCE: Students **learn** about the sun on SE pages 49-50/TE pages 140-143.

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

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1)

SE: 54
TE: 146, 150

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2)

TE: 146

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Scientists use different ways to study the world. (K-PS3-1)

SE: Related content, 49-50
TE: Related content, 140-141, 142-143, 146

Disciplinary Core Ideas

PS3.B: Conservation of Energy and Energy Transfer

- Sunlight warms Earth's surface. (K-PS3-1),(K-PS3-2)

SE: Related content, 49-50, 51-52
TE: Related content, 140-141, 142-143, 146-147

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (K-PS3-1),(K-PS3-2)

SE: 49-50, 51-52
TE: 140-141, 142-143, 146-147

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Grade K

K-LS1 From Molecules to Organisms: Structures and Processes

K-LS1 From Molecules to Organisms: Structures and Processes		
Students who demonstrate understanding can: **K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.** [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.] **INTERACTIVE SCIENCE**: Students **learn** about similarities of living things on SE pages 25/TE page 77. In Explore, TE 82, students **share observations** of plants and animals being tended and their needs. They **discuss** needs of living things on SE pages 28/TE pages 82-83. They **state** similarities of living things on SE page 30/TE pages 86-87.		
The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:		
Science and Engineering Practices **Analyzing and Interpreting Data** Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. ▪ Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **SE:** 28 **TE:** 82-83 **----------** **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** ▪ Scientists look for patterns and order when making observations about the world. (K-LS1-1) **SE:** 25, 28, 30 **TE:** 77, 82-83, 86-87	**Disciplinary Core Ideas** **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. (K-LS1-1) **SE:** 28 **TE:** 82-83	**Crosscutting Concepts** **Patterns** ▪ Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **SE:** 25, 28, 30 **TE:** 77, 82-83, 86-87

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Grade K

K-ESS2 Earth's Systems

K-ESS2 Earth's Systems

Students who demonstrate understanding can:

K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time. [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]

INTERACTIVE SCIENCE: Students **observe** weather and make a weather chart to **record** patterns on SE p. 46/TE page 136. Students **use** a weather calendar on SE page 52/TE pages 146-147.

K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]

INTERACTIVE SCIENCE: Students **learn** how humans can change the environment in the *Designing Trails and Roads* activity, Trails that Last, on STEM pages 1T-a to 21T. In Stem Project, Plan and Draw, page 9T, students **choose** their materials and **support** choices with explanations.

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

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)

SE: 46, 52
TE: 136, 146-147

Engaging in Argument from Evidence

Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).

- Construct an argument with evidence to support a claim. (K-ESS2-2)

STEM: *Designing Trails and Roads,* 1T-a to 21T

Connections to Nature of Science

Science Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (K-ESS2-1)

SE: 46, 52
TE: 136, 146-147

Disciplinary Core Ideas

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. (K-ESS2-1)

SE: 46, 52
TE: 136, 146-147

ESS2.E: Biogeology

- Plants and animals can change their environment. (K-ESS2-2)

ESS3.C: Human Impacts on Earth Systems

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (secondary to K-ESS2-2)

STEM: *Designing Trails and Roads,* 1T-a to 21T

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

SE: 46, 52
TE: 136, 146-147

Systems and System Models

- Systems in the natural and designed world have parts that work together. (K-ESS2-2)

SE: 46, 52
TE: 136, 146-147

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K-ESS3 Earth and Human Activity

K-ESS3 Earth and Human Activity

Students who demonstrate understanding can:

K-ESS3-1. 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.]

INTERACTIVE SCIENCE: Students **learn** about the needs of plants and animals living things on SE page 28/TE page 82-83. In the SE page 28 Activity, students **indicate** the image portraying needs being met. In the Home Activity, students **participate** in meeting the needs of different living things.

K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* [Clarification Statement: Emphasis is on local forms of severe weather.]

INTERACTIVE SCIENCE: Students **learn** about weather forecasting and **discuss** preparation for weather on SE page 55/TE page 151. In the SE page 55 Activity, students **match** sunny weather to the items that would be used. In Home Activity, students **watch** a weather report and **choose** clothes to match the day's weather. On TE page 151, Teach with Visuals, students **discuss** a weather map and how a weather forecast helps people get ready for their day.

K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.* [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]

INTERACTIVE SCIENCE: On SE page 16 Activity/ TE page 59, students **identify** the problem and **choose** the solution that impacts the environment. On TE page 42, Social Studies, students **discuss** trash in the community and **communicate** solutions to solve the problem.

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

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.

- Ask questions based on observations to find more information about the designed world. (K-ESS3-2)

SE: 55
TE: 151

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions.

- Use a model to represent relationships in the natural world. (K-ESS3-1)

SE: 28
TE: 82-83

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)

- Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)

SE: 16
TE: 42, 59

Disciplinary Core Ideas

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. (K-ESS3-1)

SE: 28
TE: 82-83

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. (K-ESS3-2)

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. (K-ESS3-3)

ETS1.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary to K-ESS3-2)

SE: 55
TE: 151

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to K-ESS3-3)

TE: 42

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (K-ESS3-2),(K-ESS3-3)

SE: 16, 55
TE: 59, 151

Systems and System Models

- Systems in the natural and designed world have parts that work together. (K-ESS3-1)

SE: 28
TE: 82-83

Connections to Engineering, Technology, and Applications of Science
Interdependence of Science, Engineering, and Technology

- People encounter questions about the natural world every day. (K-ESS3-2)

SE: 55
TE: 151

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. (K-ESS3-2)

SE: 55
TE: 151

GRADE 1

1-PS4 Waves and their Applications in Technologies for Information Transfer

1-PS4 Waves and their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

1-PS4-1. 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 tuning forks 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.]

INTERACTIVE SCIENCE: Students **conduct investigations** making sounds with vibrating strings on page SE/TE page 284. They **investigate** making sounds with vibrating air on SE/TE pages 288-289. On TE only pages 289a-289d, students **conduct** directed, guided, and open scaffolded inquiries of sounds and vibrating materials.

1-PS4-2. 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.]

INTERACTIVE SCIENCE: In Writing, TE page 268D, students **write** about the importance of light in their world. In Try It!, students **investigate** light on SE/TE pages 270. Students **conclude** light's effect on objects in My Planet Diary on SE/TE page 280. They **learn** about qualities of light on SE/TE 281-283.

1-PS4-3. 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), and reflective (such as a mirror).] [Assessment Boundary: Assessment does not include the speed of light.]

INTERACTIVE SCIENCE: Students **investigate** the effect of shining light on different types of objects on SE/TE page 270/TE only 283a. Students **learn** about the qualities of light on SE/TE pages 281-283. They **conduct an investigation** of light's effect on a mirror in Lightning Lab on SE/TE page 283.

1-PS4-4. 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.]

INTERACTIVE SCIENCE: Students **learn** the Hubble Space Telescope communicates information in Big World, My World, SE/TE page 30 and 21st Century Learning, TE page 283. Students **build** a device to transmit information over a distance using sound in Grade 3, Chapter 2, Lesson 3, "What is the design process?" on SE/TE page 60.

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

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. (1-PS4-1),(1-PS4-3)

SE/TE: 270, 283, 284, 288-289
TE Only: 289a-289b

Disciplinary Core Ideas

PS4.A: Wave Properties

- Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)

SE/TE: 284-289
TE only: 289a-289d

PS4.B: Electromagnetic Radiation

- Objects can be seen only when light is available to illuminate them. Some objects give off their own light. (1-PS4-2)

SE/TE: 270, 280, 281-283
TE only: 268D

Crosscutting Concepts

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1),(1-PS4-2),(1-PS4-3)

SE/TE: 270, 283, 284
TE only: 289a-289d

Connections to Engineering, Technology, and Applications of Science

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. (1-PS4-4)

SE/TE: 30, 280

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Grade 1

Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. ▪ Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-PS4-2) **SE/TE:** 270, 281-283 ▪ Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4) **TE only:** 268D **----------** **Connections to Nature of Science** **Scientific Investigations Use a Variety of Methods** ▪ Science investigations begin with a question. (1-PS4-1) **SE/TE:** 284, 288-289 ▪ Science uses different ways to study the world. (1-PS4-1) **SE/TE:** 284, 288-289	▪ 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.) (1-PS4-3) **SE/TE:** 270, 281-283 **PS4.C: Information Technologies and Instrumentation** ▪ People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4) **SE/TE:** 30, 280	

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Grade 1

1-LS1 From Molecules to Organisms: Structures and Processes

1-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

1-LS1-1. 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 and ears.]

INTERACTIVE SCIENCE: Students **gain knowledge** about the design process in Chapter 2, Lesson 3, "What is the design process?," SE/TE pages 51-55. Students **learn** about parts of plant that help them live and grow in Chapter 4, Lesson 2, SE/TE pages 122-125. They **gain knowledge** about parts of animals in Chapter 4, Lesson 1, "What are some groups of living things?" on SE/TE page 120-121, and on SE/TE page 143. In STEM *Building a Bug Box,* Enrichment, "How Do Insects Get Food?" SE/TE page 20B, students **learn** about the mouth parts of different insects.

1-LS1-2. 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) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]

INTERACTIVE SCIENCE: Students **read text** about animal parents and offspring in Chapter 4, Lesson 4, "How do some animals grow?'" on SE/TE page 131-135 and Lesson 5, "How are living things like their parents?" on SE/TE pages 136-139.

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

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
- Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1)

SE/TE: 51-55, 56-57
TE only: 55a-55b, 57b-57d

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)

SE/TE: 136-138
TE only: 139a-139b

Connections to Nature of Science
Scientific Knowledge is Based on Empirical Evidence
- Scientists look for patterns and order when making observations about the world. (1-LS1-2)

SE/TE: 120-121, 136-139
TE only: 139a-139b

Disciplinary Core Ideas

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. (1-LS1-1)

SE/TE: 120-121, 122-125, 143
STEM: *Building a Bug Box,* 20B

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. (1-LS1-2)

SE/TE: 131-135, 138-139

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. (1-LS1-1)

SE/TE: 120-121, 143
STEM: *Building a Bug Box,* 20B

Crosscutting Concepts

Patterns
- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2)

SE/TE: 120-121, 136-139
TE only: 139a-139b

Structure and Function
- The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1)

SE/TE: 51-55
STEM: *Building a Bug Box,* 20B

Connections to Engineering, Technology, and Applications of Science
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 using natural materials. (1-LS1-1)

SE/TE: 51-55

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to the Next Generation Science Standards, May 2013
Grade 1

1-LS3 Heredity: Inheritance and Variation of Traits

1-LS3 Heredity: Inheritance and Variation of Traits		
Students who demonstrate understanding can: **1-LS3-1. 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 or animals that undergo metamorphosis or hybrids.] **INTERACTIVE SCIENCE**: Students **make observations** about differences among parents and offspring in "Plants and Their Parents," Chapter 4, Lesson 5, SE/TE page 137, and "How Animals and Their Parents Are Different," SE/TE page 139. They **learn** about "Different Animals of One Kind" in Lesson 6, "How are groups of living things different?" on SE/TE page 143.		
The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:		
Science and Engineering Practices **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. ▪ Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-LS3-1) **SE/TE:** 137, 139, 143	**Disciplinary Core Ideas** **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. (1-LS3-1) **SE/TE:** 137, 138, 139, 141-143 **TE Only:** 139b **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. (1-LS3-1) **SE/TE:** 126-129, 131-135, 137, 139, 141-143 **TE Only:** 139a, 139b	**Crosscutting Concepts** **Patterns** ▪ Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS3-1) **SE/TE:** 126-129, 131-135, 136- 139, 141-143

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Grade 1

1-ESS1 Earth's Place in the Universe

1-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

1-ESS1-1. 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.]

INTERACTIVE SCIENCE: Students **use observations and prior knowledge** to understand patterns of the sun and moon in Chapter 5, Lesson 6, "What causes day and night?" on SE/TE pages 189-193. On TE page 190, 21st Century Learning, students **collaborate** to create night sky drawings and **discuss similarities**. In question 5 in the Lesson Check for Lesson 6, TE page 193b, students **describe** patterns of night and day.

1-ESS1-2. 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.]

INTERACTIVE SCIENCE: Students **learn** about the seasons in Chapter 6, Lesson 4, "What are the four seasons?" on SE/TE pages 220-223. In the Science to Social Studies activity on TE page 222, students **discuss** seasonal differences such as growing seasons, and **create** a classroom chart. In the Performance-Based Assessment, Make a Concept Map, SE/TPG page 234, students **provide information** about the seasons.

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

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)

SE/TE: 220-223

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

SE/TE: 189-193

Disciplinary Core Ideas

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. (1-ESS1-1)

SE/TE: 189-193

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)

SE/TE: Related content, 220-223

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

SE/TE: 221-223
TE Only: 193b

Connections to Nature of Science
Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes natural events happen today as they happened in the past. (1-ESS1-1)

SE/TE: 189-193

- Many events are repeated. (1-ESS1-1)

SE/TE: 189-193
TE Only: 193b

GRADE 2

2-PS1 Matter and its Interactions

2-PS1 Matter and its Interactions

Students who demonstrate understanding can:

2-PS1-1. 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.]

INTERACTIVE SCIENCE: Students **obtain information** about properties of matter in Chapter 8, Lesson 1, "What are some properties of matter?" on SE/TE pages 274-281. Students **classify** matter as metal or nonmetal and **identify** a classification, #4, in "Inquiry: Explore It" on SE/TE page 274. They **record** the properties of objects at home in "At-Home Lab" on SE/TE page 276. In Science Notebook on TE only page 279, students **describe** objects by their properties. In the Lesson 1, lesson check on TE only page 281b, students **identify** three properties of an object.

2-PS1-2. 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.]

INTERACTIVE SCIENCE: Students **gain knowledge** about the properties of matter in Chapter 8, Lesson 1, "What are some properties of matter?" on SE/TE pages 274-281.

2-PS1-3. 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.]

INTERACTIVE SCIENCE: Students **make observations** about matter they change in Chapter 8, Explore It! SE/TE page 288. They learn about small pieces of matter being reconstructed to create a new object in "Mold It, Fold It, Tear It, Bend It" on SE/TE page 290. In Lesson Check, TE only page 293b, students **tell** and **draw** ways to change objects. In the Hands-on Inquiry, STEM *Designing Recycled Paper,* page 4P, students **make observations** as they change clay and **explain** results. In Plan and Draw, STEM pages 7P-8P, students make observations as they **create** an object of small pieces, recycled paper.

2-PS1-4. 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 and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

INTERACTIVE SCIENCE: Students **learn** about irreversible changes caused by heating in Chapter 8, Lesson 3, "Other Ways Matter Can Change" on SE/TE page 291. Students **gain knowledge** about cooling changes in Lesson 4, "How can water change?" on SE/TE pages 296-297. Students **investigate** an irreversible change in "Inquiry: Investigate It" on SE/TE pages 298-299.

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

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1)

SE/TE: 274, 276
TE Only: 279, 299d

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2)

Disciplinary Core Ideas

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. (2-PS1-1)

SE/TE: 274, 275-281
TE Only: 279

- Different properties are suited to different purposes. (2-PS1-2),(2-PS1-3)

SE/TE: 274-281, 288-293
TE Only: 279

Crosscutting Concepts

Patterns

- Patterns in the natural and human designed world can be observed. (2-PS1-1)

SE/TE: 274-281
TE only: 279

Cause and Effect

- Events have causes that generate observable patterns. (2-PS1-4)

SE/TE: 291, 296-299

- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

SE/TE: 274, 275-281

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Grade 2

Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. ▪ Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (2-PS1-3) **SE/TE:** 288-293 **STEM:** *Designing Recycled Paper,* 4P, 7P-8P **Engaging in Argument from Evidence** Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). ▪ Construct an argument with evidence to support a claim. (2-PS1-4) **SE/TE:** 291, 296-299 --- **Connections to Nature of Science** **Science Models, Laws, Mechanisms, and Theories** **Explain Natural Phenomena** ▪ Science searches for cause and effect relationships to explain natural events. (2-PS1-4) **SE/TE:** 291, 296-299	▪ A great variety of objects can be built up from a small set of pieces. (2-PS1-3) **SE/TE:** 288, 290 **STEM:** *Designing Recycled Paper,* 4P, 7P-8P **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. (2-PS1-4) **SE/TE:** 291, 296-299	**Energy and Matter** ▪ Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3) **SE/TE:** 288, 289, 290 **STEM:** *Designing Recycled Paper,* 4P, 7P-8P --- **Connections to Engineering, Technology, and Applications of Science** **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 using natural materials. (2-PS1-2) **SE/TE:** 274-281

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Grade 2

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

2-LS2-1. 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.]

INTERACTIVE SCIENCE: Students **learn** about the needs of plants in Chapter 3, Lesson 4, "What are the parts of plants?" on SE/TE pages 89-93. Students **investigate** what plants need to be healthy in "Inquiry: Try It" on SE/TE page 74. Students **investigate** how water affects plant growth in "Inquiry: Investigate It" on SE/TE pages 108-109. Students **investigate** the affect of light in Unit B Performance-Based Assessment: Light and Seeds" on SE page 162/TPG page 52. In Guided Inquiry: Modify Your Investigation, TE page 109c, students **investigate** what happens when a plant is given too much water. Open Inquiry: Design Your Own Investigation, TE page 109d, allows students to **plan and conduct their** own investigations. In STEM *Building a Greenhouse,* page 20g, Enrichment lesson, "What Is the Life Cycle of a Plant?", engages students in **understanding** plants' needs.

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

INTERACTIVE SCIENCE: Students **gain knowledge** about animals dispersing seeds in Chapter 4, Lesson 4, "Seeds" on SE/TE page 135.

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

Science and Engineering Practices

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)

SE/TE: 74, 108-109
SE: 162/**TPG:** 52
TE only: 109d

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow. (2-LS2-1)

SE/TE: 89-93, 108-109
SE: 162/**TPG:** 52
STEM: *Designing Recycled Paper,* 20g

- Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

SE/TE: 135

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to 2-LS2-2)

SE/TE: 46

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (2-LS2-1)

SE/TE: 74, 89-93, 108-109
SE: 162/**TPG:** 52

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

SE/TE: 135-137

2-LS4 Biological Evolution: Unity and Diversity

2-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

2-LS4-1. 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 each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]

INTERACTIVE SCIENCE: Students **learn** about different plants and animals habitats in Chapter 3, Lesson 4, "Where do plants and animals live?" on SE/TE pages 94-99. On SE/TE page 94, Inquiry: Explore It!, students **investigate** what kind of plant can live in deserts. On TE page 99 Science Notebook, students **illustrate and write** about different habitats, the plants and animals that live there, and how they depend on each other to fulfill their needs. On TE page 99b, Lesson Check, students **identify** different habitats and their characteristics. In STEM *Building a Bug Box,* Quick Lab: "Where Are the Insects?" on page 1B-2B, students **make observations** of an insect and its habitat.

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

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1)

SE/TE: 94-99
STEM: *Designing Recycled Paper,* 1B-2B

Connections to Nature of Science
Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (2-LS4-1)

SE/TE: 94-99
STEM: *Designing Recycled Paper,* 1B-2B

Disciplinary Core Ideas

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. (2-LS4-1)

SE/TE: 94-99
TE Only: 99b
STEM: *Designing Recycled Paper,* 1B-2B

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Grade 2

2-ESS1 Earth's Place in the Universe

2-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

2-ESS1-1. 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.]

INTERACTIVE SCIENCE: Students **gain information** about rapidly and slowly occurring Earth events in Grade 3, Chapter 6, Lesson 5, "How do we describe features of Earth's surface?" on SE/TE pages 244-249. In 21st Century Learning, TE only page 244, students **use maps and conduct research** from several sources on volcanic islands.

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

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)

Grade 3
SE/TE: 244, 245-247, 248-249

Disciplinary Core Ideas

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. (2-ESS1-1)

Grade 3
SE/TE: 244, 245-247, 248-249

Crosscutting Concepts

Stability and Change

- Things may change slowly or rapidly. (2-ESS1-1)

Grade 3
SE/TE: 244, 245-247, 248-249

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Grade 2

2-ESS2 Earth's Systems

2-ESS2 Earth's Systems

Students who demonstrate understanding can:

2-ESS2-1. 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.]

INTERACTIVE SCIENCE: Students **learn** about erosion, weathering and deposition in Grade 3, Chapter 6, Lesson 6, "What are weathering and erosion?" on SE/TE pages 250-255.

2-ESS2-2. 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.]

INTERACTIVE SCIENCE: Students **gain knowledge** of landforms and bodies of water in Chapter 5, Lesson 4, "What are some kinds of land and water?" on SE/TE pages 182-187. In "At-Home Lab" on SE/TE page 184 students **illustrate** land forms and **write** a comparison. On TE page 185, 21st Century Learning, students **develop models** of landforms using clay and markers that they share with the class. In Differentiated Instruction, TE page 187, students **create models** of different bodies of water by creating books and dictionaries. In the Lesson Check, TE page 187b, students **apply** their knowledge of landforms and bodies.

2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

INTERACTIVE SCIENCE: Students **obtain information** about where water is found on Earth in Chapter 5, Lesson 4, "What are some kinds of land and water?" on SE/TE page 183 and 184, 186-187. In the Science to Math activity on page 186, students **visually represent** the area of the earth covered by oceans. Students **obtain information** about water being solid or liquid in Chapter 8, Lesson 4, "How can water change?" on SE TE pages 294-297. The Lesson Check on TE page 297b allows students to **apply their knowledge** about solids and liquids.

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

Science and Engineering Practices

Developing and Using Models
Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
- Develop a model to represent patterns in the natural world. (2-ESS2-2)

SE/TE: 183-187

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
- Compare multiple solutions to a problem. (2-ESS2-1)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)

SE/TE: 183, 186-187, 294-297

Disciplinary Core Ideas

ESS2.A: Earth Materials and Systems
- Wind and water can change the shape of the land. (2-ESS2-1)

Grade 3
SE/TE: 183-187

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. (2-ESS2-2)

SE/TE: 183-187
TE only: 187b

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. (2-ESS2-3)

SE/TE: 183, 186-187, 294-297
TE only: 297b

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. (secondary to 2-ESS2-1)

Crosscutting Concepts

Patterns
- Patterns in the natural world can be observed. (2-ESS2-2),(2-ESS2-3)

SE/TE: 183-187, 294-297
TE only: 187b, 297b

Stability and Change
- Things may change slowly or rapidly. (2-ESS2-1)

SE: 268/**TPG:** 58

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World
- Developing and using technology has impacts on the natural world. (2-ESS2-1)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World
- Scientists study the natural and material world. (2-ESS2-1)

Grade 3
SE/TE: 183-187

K-2-ETS1 Engineering Design

K-2-ETS1 Engineering Design

Pearson Project STEM Grade K-2 Titles:

- *Building a Bug Box*
- *Building a Greenhouse*
- *Building Boats*
- *Designing Recycled Paper*
- *Designing Trails and Roads*
- *Building a Rain Gauge*

Students who demonstrate understanding can:

K-2-ETS1-1. 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.

INTERACTIVE SCIENCE Grades K-2:

Students **ask questions, make observations, and gather information** in Grades K-2 Chapter 2 content cited below.
Grade K: SE page 15-16/TE page 50-51; Unit A Performance-based Assessment, TE 66
Grade 1: TE page Reading, 38C; SE/TE page 51; Lesson Check TE page 55b; Design Your Own Investigation, TE page 57d
Grade 2: SE/TE page 45, Lesson Check TE 49b; Unit A Performance Assessment, SE page 70/TPG page 46

Project STEM Grades K-2:

Students **make observations and gather information** to design a boat that is more stable in STEM *Building Boats,* pages 5B-10B. Students **make observations and gather information** about soil to **design** an improved trail in STEM *Designing Trails and Roads,* pages 6T-11T. Students **make observations and gather information** about soil to **design** an improved rain gauge in STEM *Building a Rain Gauge,* pages 6R-11R. Students **ask questions, make observations, and gather information** about insects and insect traps to **design** a better insect trap in STEM *Building a Bug Box*, pages 6B-8B. Students **ask questions, make observations, and gather information** about seeds and greenhouses to **design** a better green house in STEM *Building a Greenhouse,* pages 5G-7G.

K-2-ETS1-2. 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.

INTERACTIVE SCIENCE Grades K-2:

Students **develop** a sketch, drawing, or physical model in Grades K-2 Chapter 2 content cited below.
Grade K: SE pages 16-17, TE 61; Unit A Performance-based Assessment, TE 66
Grade 1: TE page Art, 38C; SE/TE pages 52-53; Investigate It! SE/TE pages 56; Directed Inquiry, TE page 57b; Lesson Check TE page 57d; Unit A Performance-based Assessment, SE page 46/TPG page 46
Grade 2: SE/TE page 46, Lesson Check TE only 49b, 57b, 57c, 57d; Unit A Performance Assessment "Design a Solution", SE page 70/TPG page 46.

Project STEM Grades K-2:

Students **investigate** which shapes of objects will float in STEM *Building Boats,* page 1B. Students **design, build, and draw** a boat in STEM *Building Boats,* pages 11B-12B. Students **develop a physical model** to illustrate how the shape of soil particles helps make a better trail in STEM *Designing Trails and Roads,* page 12T. Students **draw** pictures of the parts and a plan for a rain gauge in STEM *Building a Rain Gauge,* pages 10R-12R. Students **develop and draw** a plan for an insect trap in STEM *Building a Bug Box,* pages 9B-11B. Students **develop and draw** a plan for green house in STEM *Building a Greenhouse,* pages 9G-11G.

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Grade 2

K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

INTERACTIVE SCIENCE Grades K-2:
Students **analyze data** in Grades K-2 Chapter 2 content cited below.
Grade K: SE pages 17-18/TE pages 54-55
Grade 1: SE/TE page 42, SE/TE page 50; SE/TE pages 54-55; Investigate It! SE/TE pages 57; Investigate It! TE page 57b-57c; Unit A Performance-based Assessment, SE page 46/TPG page 46
Grade 2: SE/TE page 47, 48-49, Lesson Check TE 49b; Unit A Performance Assessment, SE page 70/TPG page 46

Project STEM Grades K-2:
Students **compare** boat designs in STEM *Building Boats,* pages 12B-14B. Students **compare** different soil types used to make a trail in STEM *Designing Trails and Roads,* pages 13T-14T. Students **compare** their rain gauge designs to other students' designs in STEM *Building a Rain Gauge,* pages 12R-14R. Students **analyze data** about the number of insects trapped and **compare** designs in STEM *Building a Bug Box,* pages 13B-15B. Students **analyze data** about the leaf size and **compare** designs in STEM *Building a Greenhouse,* pages 12G-15G.

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

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.
- Ask questions based on observations to find more information about the natural and/or designed world. (K-2-ETS1-1)

Grades K-2 STEM: *Building Boats*, 5B-10B; *Designing Trails and Roads*, 6T-11T; *Building a Rain Gauge*, 6R-11R; *Building a Bug Box*, 6B-8B; *Building a Greenhouse*, 5G-7G

- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Grades K-2 STEM: *Building Boats*, 1B, 11B-12B; *Designing Trails and Roads*, 12T *Building a Rain Gauge*, 10R-12R; *Building a Bug Box*, 9B-11B; *Building a Greenhouse*, 9G-11G

Developing and Using Models
Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

Grades K-2 STEM: *Building Boats*, 1B, 11B-12B; *Designing Trails and Roads*, 12T *Building a Rain Gauge*, 10R-12R; *Building a Bug Box*, 9B-11B; *Building a Greenhouse*, 9G-11G

Disciplinary Core Ideas

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. (K-2-ETS1-1)

Grades K-2 STEM:
Building Boats, 5B-10B; *Designing Trails and Roads*, 6T-11T; *Building a Rain Gauge*, 6R-11R; *Building a Bug Box*, 6B-8B; *Building a Greenhouse*, 5G-7G
- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)

Grades K-2 STEM: *Building Boats*, 5B-10B; *Designing Trails and Roads*, 6T-11T; *Building a Rain Gauge*, 6R-11R; *Building a Bug Box*, 6B-8B; *Building a Greenhouse*, 5G-7G

- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

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. (K-2-ETS1-2)

Grades K-2 STEM: *Building Boats*, 5B-10B; *Designing Trails and Roads*, 6T-11T; *Building a Rain Gauge*, 6R-11R; *Building a Bug Box*, 6B-8B; *Building a Greenhouse*, 5G-7G

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. (K-2-ETS1-3)

Grades K-2 STEM: *Building Boats*, 12B-14B; *Designing Trails and Roads*, 13T-14T; 12R-14R; *Building a Bug Box*, 13B-15B; *Building a Greenhouse*, 12G-15G

Crosscutting Concepts

Structure and Function
- The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Grades K-2 STEM: *Building Boats*, 1B, 11B-12B; *Designing Trails and Roads*, 12T; *Building a Rain Gauge*, 10R-12R; *Building a Bug Box*, 9B-11B; *Building a Greenhouse*, 9G-11G

Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. ▪ Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3) **Grades K-2 STEM:** *Building Boats*, 12B-14B; *Designing Trails and Roads*, 13T-14T; 12R-14R; *Building a Bug Box*, 13B-15B; *Building a Greenhouse*, 12G-15G		

GRADE 3

3-PS2 Motion and Stability: Forces and Interactions

3-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, 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.]

INTERACTIVE SCIENCE: Students **obtain information** about balanced and unbalanced forces in Chapter 10, Lesson 2, "How does force affect motion?" on SE/TE pages 418-419. In Differentiated Instruction on page 419, students **prepare** a class presentation. In STEM, *Designing Bridges* Enrichment: What Are the Three Laws of Motion?" page 13B, students **apply knowledge** about balances on an object. In Assessment on page 14B, students **resolve** a balance problem.

3-PS2-2. 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.]

INTERACTIVE SCIENCE: Students **learn** an object's motion in Chapter 10, Lesson 2, "How does force affect motion?" on SE/TE pages 414-419. Students **observe, measure,** and **predict** the movement of balls with different masses in "Inquiry: Explore It" on SE/TE pages 414. They **observe and measure** changes in motion as mass varies in, "Lightning Lab" on SE/TE page 416. Students **observe, measure,** and **predict** the movement of a ball on a ramps of different heights in "Inquiry: Investigate It" on SE/TE pages 426-427.

3-PS2-3. 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 and 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 and 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.]

INTERACTIVE SCIENCE: Students **gain knowledge** about static electricity in Chapter 9, Lesson 6 section on "Electric Charges," SE/TE page 387. Students **observe** and **predict** the effects of magnetic forces on objects acting in "Inquiry: Try It" on SE/TE page 406. Students **obtain information** about magnetism in Chapter 10, Lesson 2, "How does force affect motion?" on SE/TE pages 420-421.

3-PS2-4. 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.]

INTERACTIVE SCIENCE: Students **learn** about magnetism in Chapter 10, Lesson 2, "How does force affect motion?" on SE/TE pages 420-421.

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

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3)

SE/TE: 406, 414, 416, 426-427

- Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4)

SE/TE: 54, 61-65

Disciplinary Core Ideas

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.) (3-PS2-1)

SE/TE: 418-419

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions. (3-PS2-2)

SE/TE: 414-419, 426-427
STEM: *Designing Bridges*, 13B

Cause and Effect

- Cause and effect relationships are routinely identified. (3-PS2-1)

SE/TE: 418-419
STEM: *Designing Bridges*, 13B, 14B

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Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered (3-PS2-1).

SE/TE: 406, 414, 416, 426-427

- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2)

SE/TE: 406, 414, 416, 426-427
STEM: *Designing Bridges*, 14B

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Apply scientific ideas to solve design problems. (3-PS2-4)

SE/TE: SE/TE: 54, 61-65, 406, 414, 416, 426-427

Connections to Nature of Science
Science Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns. (3-PS2-2)

SE/TE: 406, 414, 416, 426-427
STEM: *Designing Bridges*, 13B

Scientific Investigations Use a Variety of Methods

- Science investigations use a variety of methods, tools, and techniques. (3-PS2-1)

SE/TE: 406, 414, 416, 426-427

- 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.) (3-PS2-2)

SE/TE: 414-419
STEM: *Designing Bridges*, 13B

PS2.B: Types of Interactions

- Objects in contact exert forces on each other. (3-PS2-1)

SE/TE: 418-419
STEM: *Designing Bridges*, 13B

- 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. (3-PS2-3),(3-PS2-4)

SE/TE: 387, 414-419, 420-421

- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3)

SE/TE: 387, 406, 420-421

Connections to Engineering, Technology, and Applications of Science

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. (3-PS2-4)

SE/TE: 61-65

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3-LS1 From Molecules to Organisms: Structures and Processes

3-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

3-LS1-1. 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.]

INTERACTIVE SCIENCE: Students **obtain knowledge** about the life cycle of plants in Chapter 3, Lesson 3, "How do plants use flowers and cones to reproduce?" on SE/TE pages 110-113 and Lesson 4, "What are the life cycles of some plants?" on SE/TE pages 117-121. They **learn** about life cycle of animals in Chapter 4, Lesson 3, "What are the life cycles of some animals?" on SE/TE 154-161. Students **develop a model** of a plants life cycle in "At-Home Lab" on SE/TE page 120. They **develop a model** of the grain beetle life cycle in "Inquiry: Explore It" on SE/TE page 154. Students **develop a model** of the butterfly life cycle in "Science Writing" on TE only page 156. On SE/TE page 157, in 21st Century Learning, students **research** an insect and **create a poster** with captions of its life cycle stages. Students **develop a model** of the frog life cycle in "Science Writing" on TE page 158. They **describe** the life cycle of a giraffe in Lesson 4 lesson check on TE page 161b. In Unit B, Performance-based Assessment, SE page 214/TPG page 54, students **make** a poster of the stages in an animal's life cycle.

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

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop models to describe phenomena. (3-LS1-1)

SE/TE: 117-121, 154-161
SE: page 214/**TPG:** page 54

Connections to Nature of Science
Scientific Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns. (3-LS1-1)

SE/TE: 117-121, 154-161
SE: page 214/**TPG:** page 54

Disciplinary Core Ideas

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. (3-LS1-1)

SE/TE: 110-113, 117-121, 154-161
SE: page 214/**TPG:** page 54

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions. (3-LS1-1)

SE/TE: 117-121, 154-161

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Grade 3

3-LS2 Ecosystems: Interactions, Energy, and Dynamics

3-LS2 Ecosystems: Interactions, Energy, and Dynamics		
Students who demonstrate understanding can: **3-LS2-1. Construct an argument that some animals form groups that help members survive.** **INTERACTIVE SCIENCE**: Students **learn** how group behavior of honey bees helps the species survive in Chapter 4, Lesson 2 My Planet Diary Discovery on SE/TE page 146.		
The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:		
Science and Engineering Practices **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds. ▪ Construct an argument with evidence, data, and/or a model. (3-LS2-1) **SE/TE:** 146 **TE only:** 153a	**Disciplinary Core Ideas** **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 (Note: Moved from K–2). (3-LS2-1) **SE/TE:** 146 **TE only:** 153a	**Crosscutting Concepts** **Cause and Effect** ▪ Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1) **SE/TE:** 146 **TE only:** 153a

3-LS3 Heredity: Inheritance and Variation of Traits

3-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

3-LS3-1. 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.]

INTERACTIVE SCIENCE: Students **analyze and interpret** information about traits inherited by plants and animals in Chapter 4, Lesson 2, "How are offspring like their parents?" on SE/TE pages 146-153. On SE/TE page 247 students **compare and contrast** characteristics of antelopes shown. In At Home Lab, SE/TE page 148, students **collect and analyze** information, then **make a poster** of parents and offspring. Students **classify** characteristics of plants and animals into inherited and acquired in "Science Notebook" on TE only page 149. Students **analyze and interpret** "Small Differences in Traits" and "Differences That Can Harm an Animal" on SE/TE pages 152-153.

3-LS3-2. 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 normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

INTERACTIVE SCIENCE: Students **learn** how traits can be influenced by the environment in Chapter 4, Lesson 2, "How are offspring like their parents?" on SE/TE pages 152-153. In 21st Century Learning, SE/TE page 153, students **collaborate to research** the beaks of finches on Galapagos Islands and how these differences help or hinder their survival.

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

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations.

When possible and feasible, digital tools should be used.

- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)

SE/TE: 149
TE only: 153

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2)

SE/TE: 149
TE only: 153

Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents. (3-LS3-1)

SE/TE: 146-153

- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2)

SE/TE: 152-153

LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)

SE/TE: 146-153

- The environment also affects the traits that an organism develops. (3-LS3-2)

SE/TE: 152-153
TE only: 153

Crosscutting Concepts

Patterns

- Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)

SE/TE: 146-153

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)

SE/TE: 152-153

3-LS4 Biological Evolution: Unity and Diversity

3-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

3-LS4-1. 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 fossil 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 present plants and animals. Assessment is limited to major fossil types and relative ages.]

INTERACTIVE SCIENCE: Students **obtain and analyze** information about fossils in Grade 4, Chapter 4, Lesson 5, "What are fossils?" on SE/TE pages 168-173 and Lesson 6, "What can fossils tell us?" on SE/TE pages 174-179. In Lightning Lab on SE/TE page 173, students **analyze data** from footprints and **draw conclusions**. In 21st Century Learning, TE page 173, students **collaborate to research** a type of fossil and produce a media presentation.

3-LS4-2. 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. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

INTERACTIVE SCIENCE: Students **gain understanding** about variations in characteristics of species in Chapter 4, "Small Differences in Traits" on SE/TE pages 152-153. On page 153, Got It!, #13, they **use evidence** and **apply** their knowledge. On that same page, the 21st Century Learning task engages students in **collaborating to research** the beaks of finches on Galapagos Islands to determine if differences help or hinder their survival.

3-LS4-3. 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. [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.]

INTERACTIVE SCIENCE: Students **obtain information** about organisms and their survival in their habitats in Chapter 5, Lesson 1, "What is an ecosystem?" on SE/TE pages 179-183. On SE/TE page 183, "Ecosystems Change" students **learn** how habitat changes affect survival of organisms.

3-LS4-4. 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.]

INTERACTIVE SCIENCE: Students **learn** how habitat changes affect survival of organisms on SE/TE page 183, "Ecosystems Change." They **obtain information** about animal and plant changes in an ecosystem when the ecosystem changes in Chapter 5, Lesson 3, "How do ecosystems change?" on SE/TE pages 190-197. Students **make a claim** about what would happen to marsh turtles if the water in the ecosystem dried up in # 4 on SE/TE page 180. Students **make a claim** about changes in an ecosystem due to a drought in # 5 of Lesson 3 Lesson Check, TE page 197b.

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. ▪ Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1) **SE/TE:** 179-183, 190-197 **Grade 4:** **SE/TE:** 168-173, 174-179 **TE only:** 176	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** ▪ When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (secondary to 3-LS4-4) **SE/TE:** 179-183, 190-197 **TE only:** 180, 197b	**Cause and Effect** ▪ Cause and effect relationships are routinely identified and used to explain change. (3-LS4-2),(3-LS4-3) **SE/TE:** 152-153, 179-183 **Scale, Proportion, and Quantity** ▪ Observable phenomena exist from very short to very long time periods. (3-LS4-1) **Grade 4:** **SE/TE:** 168-173, 174-179

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Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. ▪ Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2) **SE/TE:** 152-153 **TE only:** 180, 197b **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds. ▪ Construct an argument with evidence. (3-LS4-3) **SE/TE:** 179-183 ▪ Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4) **SE/TE:** 179-183, 190-197	**LS4.A: Evidence of Common Ancestry and Diversity** ▪ Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (Note: moved from K-2) (3-LS4-1) **Grade 4:** **SE/TE:** 168-173, 174-179 **TE only:** 176 ▪ Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-1) **Grade 4:** **SE/TE:** 168-173, 174-179 **TE only:** 176 **LS4.B: Natural Selection** ▪ Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2) **SE/TE:** 152-153 **LS4.C: Adaptation** ▪ For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3) **SE/TE:** 179-183 **TE only:** 180, 197b **LS4.D: Biodiversity and Humans** ▪ Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4) **SE/TE:** 179-183, 190-197 **TE only:** 180, 197b	**Systems and System Models** ▪ A system can be described in terms of its components and their interactions. (3-LS4-4) **SE/TE:** 179-183, 190-197 --- **Connections to Engineering, Technology, and Applications of Science** **Interdependence of Science, Engineering, and Technology** ▪ Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-3) **SE/TE:** 179-183 --- **Connections to Nature of Science** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ▪ Science assumes consistent patterns in natural systems. (3-LS4-1) **SE/TE:** 179-183, 190-197 **Grade 4:** **SE/TE:** 168-173, 174-179 **TE only:** 176

3-ESS2 Earth's Systems

3-ESS2 Earth's Systems

Students who demonstrate understanding can:

3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [Clarification Statement: Examples of data at this grade level 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.]

INTERACTIVE SCIENCE: Students **gain knowledge** about weather and climate in Chapter 6, Lesson 2, "What are weather and climate?" on SE/TE pages 225-227. In Science Notebook, TE page 227, students **represent data** in **profiles and charts** of places and their weather conditions.

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

INTERACTIVE SCIENCE: Students **obtain information** about climates in different regions in Chapter 6, Lesson 2, "Factors That Affect Climate" on SE/TE page 227. See also Grade 5, Chapter 7, Lesson 5, "What is climate?" on SE/TE pages 284-285.

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

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Represent data in tables and various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (3-ESS2-1)

TE only: 227

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

- Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2)

TE only: 227

Disciplinary Core Ideas

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. (3-ESS2-1)

SE/TE: 225-227

- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2)

SE/TE: 227

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions. (3-ESS2-1),(3-ESS2-2)

SE/TE: 225-227

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3-ESS3 Earth and Human Activity

3-ESS3 Earth and Human Activity		
Students who demonstrate understanding can: **3-ESS3-1. 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 lighting rods.] **INTERACTIVE SCIENCE**: Students **learn** about hurricanes, floods, and droughts in "Natural Events Cause Change" on SE/TE page 194.		
The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:		
Science and Engineering Practices **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ▪ Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-ESS3-1)	**Disciplinary Core Ideas** **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. (3-ESS3-1) (Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.) **SE/TE:** 194	**Crosscutting Concepts** **Cause and Effect** ▪ Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1) **SE/TE:** 194 **----------** **Connections to Engineering, Technology, and Applications of Science** **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). (3-ESS3-1) **----------** **Connections to Nature of Science** **Science is a Human Endeavor** ▪ Science affects everyday life. (3-ESS3-1)

GRADE 4

4-PS3 Energy

4-PS3 Energy

Students who demonstrate understanding can:

4-PS3-1. 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.]

INTERACTIVE SCIENCE: Students **learn** about the relationship between speed and an object's energy in Chapter 8, Lesson 1, "Energy and Motion", page 358. On TE page 258, Science Notebook, students **list** objects and their speed in order, from those having the most kinetic energy to the least. Students **obtain information** about speed in Chapter 10, Lesson 2, "What is speed?" on SE/TE pages 444-449. In the At-Home Lab on page 446, students **explain** the differences in speed when rolling a ball with different amounts of force.

4-PS3-2. 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.]

INTERACTIVE SCIENCE: Students **learn** about energy and the transfer of energy in Chapter 8, "Energy and Heat." In "Inquiry: Explore It" on SE/TE page 372, students **observe** energy transferred from warmer to colder water. In the At-Home Lab on SE/TE page 374, students **measure** temperatures in different parts of their homes and use the measurements to **explain** the movement of energy in their home. In the Inquiry: Investigate It! on SE/TE pages 378-379/TE only page 379b-379c, students **observe** the transfer of energy from water to spoons.

4-PS3-3. 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.]

INTERACTIVE SCIENCE: Students **gain understanding** about the collisions of objects in Grade 5, Chapter 11, Lesson 2, SE/TE pages 470-477. Students **predict** the outcome of a collision in grade 5 Inquiry: Explore It on SE/TE page 470. On SE/TE page 477, #10, students **predict** the outcome on the collision of bumper cars.

4-PS3-4. 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 energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or 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.]

INTERACTIVE SCIENCE: In Chapter 9, Lesson 2, Inquiry: Explore It! on SE/TE page 400, students **build** a circuit that converts chemical energy to electric energy to light energy. In Inquiry: Explore It! on SE/TE page 414, students **build** a motor that converts stored energy to energy of motion. On TE only page 421d, students **design** their own investigation.

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3)

SE/TE: 378-379, 420-421

Grade 5:

SE/TE: 470, 477

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- The faster a given object is moving, the more energy it possesses. (4-PS3-1)

SE/TE: 358, 444

- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3)

SE/TE: 400-405, 407-409, 414-419

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. (4-PS3-2),(4-PS3-3)

Crosscutting Concepts

Energy and Matter

- Energy can be transferred in various ways and between objects. (4-PS3-1), (4-PS3-2),(4-PS3-3),(4-PS3-4)

SE/TE: 358, 378-379, 400-405, 407-409, 414-419

Grade 5:

SE/TE: 470

▪ Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2) **SE/TE:** 378-379, 420-421 **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. ▪ Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1) **SE/TE:** 358, 378-379, 420-421 ▪ Apply scientific ideas to solve design problems. (4-PS3-4) **SE/TE:** 378-379, 420-421	**SE/TE:** 350, 354-355 **Grade 5** **SE/TE:** 470-477 ▪ Light also transfers energy from place to place. (4-PS3-2) **SE/TE:** 366-371 ▪ 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. (4-PS3-2),(4-PS3-4) **SE/TE:** 400-405 **PS3.C: Relationship Between Energy and Forces** ▪ When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3) **Grade 5:** **SE/TE:** 470-477 **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. (4-PS3-4) **SE/TE:** 376, 407-409 **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. (secondary to 4-PS3-4) **SE/TE:** 402, 406, 420	---------- **Connections to Engineering, Technology, and Applications of Science** **Influence of Science, Engineering and Technology on Society and the Natural World** ▪ Engineers improve existing technologies or develop new ones. (4-PS3-4) **SE/TE:** 406 ---------- **Connections to Nature of Science** **Science is a Human Endeavor** ▪ Most scientists and engineers work in teams. (4-PS3-4) ▪ Science affects everyday life. (4-PS3-4) **SE/TE:** 354-357, 376, 389, 406, 407-409, 417, 419

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Grade 4

4-PS4 Waves and their Applications in Technologies for Information Transfer

4-PS4 Waves and their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

4-PS4-1. 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.]

INTERACTIVE SCIENCE: Students **obtain information** about waves, amplitude, and wavelength in Chapter 8, Lesson 2, "What is Sound?" on SE/TE pages 360-365. In Science Notebook, TE only page 363, students **draw a model** of a wave, **labeling** each part and **defining** it. In Differentiated Instruction, TE only page 365, students **draw a model** of sound waves.

4-PS4-2. 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 and seen, the cellular mechanisms of vision, or how the retina works.]

INTERACTIVE SCIENCE: Students **learn** about light reflecting from objects and entering the eye in Chapter 8, Lesson 3, "What is Light Energy?" in "Light Waves We See" on SE/TE page 368 and "Light and Matter" on SE/TE pages 370-371.

4-PS4-3. 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 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]

INTERACTIVE SCIENCE: The citations below indicate areas in ***Interactive Science*** where this concept is introduced at this grade level.

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1)

TE only: 363, 365

- Develop a model to describe phenomena. (4-PS4-2)

TE only: 363, 365

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-PS4-3)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns. (4-PS4-1)

SE/TE: 360-365

Disciplinary Core Ideas

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; it does not move in the direction of the wave except when the water meets the beach. (Note: The grade band endpoint was moved from K–2).(4-PS4-1)

SE/TE: 363-365

- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1)

SE/TE: 363-365

PS4.B: Electromagnetic Radiation

- An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)

SE/TE: 368, 370-371

PS4.C: Information Technologies and Instrumentation

- Digitized information 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. (4-PS4-3)

TE only: 402

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. (secondary to 4-PS4-3)

TE only: 403
STEM: *Designing Bridges,* 9B-10B

Crosscutting Concepts

Patterns

- Similarities and differences in patterns can be used to sort and classify natural phenomena. (4-PS4-1)

SE/TE: 363-365, 412, 415

- Similarities and differences in patterns can be used to sort and classify designed products. (4-PS4-3)

SE/TE: 402-405, 413

Cause and Effect

- Cause and effect relationships are routinely identified. (4-PS4-2)

SE/TE: 363-365

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3)

SE/TE: 389, 402-405, 416-419
STEM: *Designing Bridges,* 11B

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Grade 4

4-LS1 From Molecules to Organisms: Structures and Processes

4-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

INTERACTIVE SCIENCE: Students **obtain information** about internal and external structures of plants and animals in Chapter 3, "Plants and Animals." In "Inquiry: Try It" on SE/TE page 82 students **observe** and **classify** internal parts of plant flowers plants. In #7 on SE/TE page 97, students **explain** how seeds are protected inside an apple. Students **explain** the functions of the pistil and the stamen in #11 on SE/TE page 99. In #7 on SE/TE page 104, students **form hypotheses** about roots, stems, and leaves. Students **form a hypothesis** about how the shape of leaves helps a plant survive in #9 on SE/TE page 105. They **summarize** the role of leaves in producing food in plants in #11 on SE/TE page 105. Students **identify** structures that help a snowshoe hare survive in its environment in #2 on SE/TE page 107. In #5 on SE/TE page 109, students **describe** physical characteristics of animals that help them to survive.

4-LS1-2. 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.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

INTERACTIVE SCIENCE: Students **obtain information** about the concepts of stimulus, behavior, and instinct in Chapter 3, Lesson 6, "How do animals respond to their environment?" on SE/TE pages 119-123.

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

Science and Engineering Practices

Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models to represent events and design solutions.

- Use a model to test interactions concerning the functioning of a natural system. (4-LS-1-2)

SE/TE: 98, 106-111, 180-181

Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Construct an argument with evidence, data, and/or a model. (4-LS1-1)

SE/TE: 100, 106, 124-125

Disciplinary Core Ideas

LS1.A: Structure and Function

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

SE/TE: 86-87, 88-89, 90-91, 93-99, 101-105, 107-111

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. (4-LS1-2)

SE/TE: 118, 119-123

Crosscutting Concepts

Systems and System Models

- A system can be described in terms of its components and their interactions. (4-LS1-1), (4-LS1-2)

SE/TE: 86-87, 88-89, 90-91, 93-99

4-ESS1 Earth's Place in the Universe

4-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

4-ESS1-1. 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 shell fossils above rock layers with plant fossils and no shells, indicating a change from water to land 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.]

INTERACTIVE SCIENCE: Students **obtain information** about fossils and geological dating in Chapter 4, Lesson 5, "What are fossils?" on SE/TE pages 168-173 and Lesson 6, "What can fossils tell us?" on SE/TE pages 174-179. They **learn** about rock layers in Chapter 5, Lesson 2, "How are rocks classified?" on SE/TE pages 212-215. Students **draw a conclusion** about the age of rocks by using evidence from fossils in #7 on SE/TE pages 178. In #9 on SE/TE page 179, they **use evidence** to **infer** what a sea creature fossil on top of a mountain indicates about the changing landscape.

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

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to de sign problems.

- Identify the evidence that supports particular points in an explanation. (4-ESS1-1)

SE/TE: 177-179

Disciplinary Core Ideas

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. (4-ESS1-1)

SE/TE: 168-173, 177-179

Crosscutting Concepts

Patterns

- Patterns can be used as evidence to support an explanation. (4-ESS1-1)

SE/TE: 177, 178

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems. (4-ESS1-1)

SE/TE: 168-173, 177, 178

4-ESS2 Earth's Systems

4-ESS2 Earth's Systems

Students who demonstrate understanding can:

4-ESS2-1. 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, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

INTERACTIVE SCIENCE: Students **obtain information** about weathering and erosion in Chapter 5, Lesson 3, SE/TE pages 218-223/TE only 223a. Students **model** weathering in the "Inquiry: Explore It" activity on page 218. They **model** different rates of erosion by water in the At-Home Lab on SE/TE page 222. In Apply It!, SE pages 296-299/TPG pages 58-61, students **explore through observations and measurement** what affects soil erosion. In STEM Building for Erosion Control, page 1E, students **model and observe** a landslide. On pages 7E-8E, students **design and construct** a prototype of a riverbank enforcement, **measuring** the rate of erosion.

4-ESS2-2. 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.]

INTERACTIVE SCIENCE: Students **analyze and interpret data** from maps in Grade 5 Chapter 5 SE/TE pages 264, 265, 266, and Chapter 8, SE/TE pages 329, 330-331.

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

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1)

SE/TE: 218, 222, 229, 296-299
TPG: 58-61
STEM: *Building for Erosion Control,* 1E, 7E-8E

Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)

SE/TE: 218, 222
Grade 5
SE/TE: 264, 265, 266, 329, 330-331

Disciplinary Core Ideas

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. (4-ESS2-1)

SE/TE: 218-223, 228, 296-299
TPG: 58-61
STEM: *Building for Erosion Control,* 1E, 7E-8E

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. (4-ESS2-2)

SE/TE: 225
Grade 5
SE/TE: 264, 265, 266, 329, 330-331

ESS2.E: Biogeology

- Living things affect the physical characteristics of their regions. (4-ESS2-1)

SE/TE: 220-221

Crosscutting Concepts

Patterns

- Patterns can be used as evidence to support an explanation. (4-ESS2-2)

Grade 5
SE/TE: 264, 265, 266, 329, 330-331

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1)

SE/TE: 218, 222, 229, 296-299
TPG: 58-61
STEM: *Building for Erosion Control,* 1E, 7E-8E

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Grade 4

4-ESS3 Earth and Human Activity

4-ESS3 Earth and Human Activity

Students who demonstrate understanding can:

4-ESS3-1. 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, and sunlight; non-renewable energy resources are fossil fuels and 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 burning of fossil fuels.]

INTERACTIVE SCIENCE: Students **obtain information** about fossil fuels in Chapter 4, SE/TE pages 179. In the Go Green activity, students **list ways** to reduce electricity and conserve fossil fuels. In Chapter 8 SE/TE page 376, students **learn** how fossil fuels are used in the environment. Students **obtain information** about solar energy use in the environment in Chapter 8, "Solar Cooking" on SE/TE page 389.

4-ESS3-2. 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 and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

INTERACTIVE SCIENCE: Students **learn** about the impact of earthquakes on the Earth in Chapter 5, Lesson 4, "How can Earth's surface change rapidly?" on SE/TE pages 224-225 and 227. They **obtain information** about floods on SE/TE pages 228 and 240, and about volcanoes on SE/TE page 226. In STEM, *Designing Bridges,* pages 6B and 12B, students **generate solutions** to make a bridge that can withstand earthquakes.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)

STEM: *Designing Bridges,* 6B, 12B

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.

- Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)

Disciplinary Core Ideas

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. (4-ESS3-1)

SE/TE: 179, 376, 389

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. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.)

SE/TE: 224-228, 240
STEM: *Designing Bridges,* 6B, 11B, 12B

ETS1.B: Designing Solutions to Engineering Problems

- Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)

STEM: *Designing Bridges,* 6B, 11B, 12B

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1)

SE/TE: 224-228

- Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3-2)

SE/TE: 224-228
STEM: *Designing Bridges,* 6B, 11B, 12B

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1)

SE/TE: 389
STEM: *Designing Bridges,* 11B

Influence of Science, Engineering and Technology on Society and the Natural World

- Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)

SE/TE: 389
STEM: *Designing Bridges,* 11B

- Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)

SE/TE: 389
STEM: *Designing Bridges,* 6B, 11B, 12B

GRADE 5

5-PS1 Matter and Its Interactions

5-PS1 Matter and Its Interactions

Students who demonstrate understanding can:

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence 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.]

INTERACTIVE SCIENCE: In Chapter 10, Lesson 1, "What makes up matter?", SE/TE pages 420-423, students **learn** about subatomic particles, atoms and molecules. In Differentiated Instruction on TE 420, students **make a model** of a carbon atom. In Differentiated Instruction on TE page 422, students **draw models** of compounds. In Response to Intervention, TE page 443, students **develop a model** of an atom. In the Inquiry: Explore It! activity on SE/TE page 442, students **demonstrate** the existence of particles of air too small to see by heating air in a closed container with a balloon attached to it.

5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]

INTERACTIVE SCIENCE: Students **learn** about phase changes in Chapter 10, Lesson 3, "What are solids, liquids, and gases?" They **obtain information** about mixtures and solutions in Lesson 4, "What are mixtures and solutions?" Students **learn** about chemical and physical changes in Lesson 5, "How does matter change?" Students **measure** weight and volume to demonstrate that the weight of a mixture did not change in Inquiry: Try It! on SE/TE page 414. In STEM, Building a Super Sneaker, page 4S, students **measure and chart** combined objects to analyze how weight and volume are affected.

5-PS1-3. Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, 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 and weight.]

INTERACTIVE SCIENCE: Students **gain understanding** of the physical properties of matter in Chapter 10, Lesson 2, "How can matter be described?" on SE/TE pages 424-429. In the Inquiry: Explore It! activity on SE/TE page 424, students **observe and identify** the properties of solids. In Science to Math, TE page 426, students **estimate** and **measure** materials. In the Inquiry: Explore It! activity on SE/TE page 436, students **observe** physical properties to distinguish steel, brass and plastic fasteners. In STEM, *Building for Erosion Control,* page 3E, students **make observations and measurements** to identify properties of materials.

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

INTERACTIVE SCIENCE: Students **conduct** an investigation to separate the components of a mixture in Chapter 10 Inquiry: Explore It! on SE/TE page 436. Students **conduct** an investigation to separate the components of a mixture in "Inquiry: Investigate It" on SE/TE page 448-449. In Unit D Performance-based Assessment SE page 538/TPG page 72, students **compare** the solubility of materials with water.

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ▪ Develop a model to describe phenomena. (5-PS1-1) **SE/TE:** 442 **TE only:** 420, 422, 443	**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 shows 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; the effects of air on larger particles or objects. (5-PS1-1) **SE/TE:** 420-423, 442	**Cause and Effect** ▪ Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4) **Scale, Proportion, and Quantity** ▪ Natural objects exist from the very small to the immensely large. (5-PS1-1) **SE/TE:** 420-423, 442

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Grade 5

Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. ▪ Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4) **SE/TE:** 414, 424, 430, 436, 442, and 448-449 ▪ Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3) **SE/TE:** 414, 424, 430, 436, 442, and 448-449 **STEM:** *Building for Erosion Control,* 3E **Using Mathematics and Computational Thinking** Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. ▪ Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS2-2) **SE/TE:** 414, 427, 434 **STEM:** *Building a Super Sneaker*, 4S	▪ The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2) **SE/TE:** 414 **STEM:** *Building a Super Sneaker,* 4S ▪ 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.) (5-PS1-3) **SE/TE:** 424-429, 436 **STEM:** *Building for Erosion Control,* 3E **PS1.B: Chemical Reactions** ▪ When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4) **SE/TE:** 445-447 ▪ 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.) (5-PS1-2) **SE/TE:** 414 **STEM:** *Building a Super Sneaker*, 4S	▪ Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2),(5-PS1-3) **SE/TE:** 414 **STEM:** *Building for Erosion Control,* 3E --- **Connections to Nature of Science** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ▪ Science assumes consistent patterns in natural systems. (5-PS1-2) **SE/TE:** 414 **STEM:** *Building a Super Sneaker,* 4S

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5-PS2 Motion and Stability: Forces and Interaction

5-PS2 Motion and Stability: Forces and Interactions		
Students who demonstrate understanding can: **5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.** Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.] **INTERACTIVE SCIENCE**: Students **gain understanding** of gravity and the direction it exerts in Chapter 11, Lesson 1, "What are forces?" on SE/TE page 468. In the At-Home Lab, students **demonstrate** the direction of gravities force by comparing gravity's effect on their body. On SE/TE page 469, Got It?, # 8, students **conclude** the big question of gravity.		
The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:		
Science and Engineering Practices **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ▪ Support an argument with evidence, data, or a model. (5-PS2-1) **SE/TE:** 468	**Disciplinary Core Ideas** **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. (5-PS2-1) **SE/TE:** 468, 469	**Crosscutting Concepts** **Cause and Effect** ▪ Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1) **SE/TE:** 468, 469

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5-PS3 Energy

5-PS3 Energy		
Students who demonstrate understanding can: **5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.** [Clarification Statement: Examples of models could include diagrams, and flow charts.] **INTERACTIVE SCIENCE**: Students **gain understanding** of the origins of energy in animals' food, food chains, and food webs in Chapter 6, Lesson 2, "How do organisms interact in ecosystems?" on SE/TE pages 218-221. In #3 on SE/TE page 219, students **distinguish** among producers, consumers and decomposers. Students **use** the food chain model in #4 on SE/TE page 220. In the Science Notebook activities on TE 220 and 221, students **write the sequence** of energy movement in the prairie food chain, and draw the prairie food web. Students **model** food chains within a food web in #7 on SE/TE page 221. In STEM, *Designing Bird Feeders,* pages 13B and 14B, students **draw models** of a food chain.		
The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:		
Science and Engineering Practices **Developing and Using Models** Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ▪ Use models to describe phenomena. (5-PS3-1) **SE/TE:** 218-221 **STEM:** *Designing Bird Feeders,* 13B, 14B	**Disciplinary Core Ideas** **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). (5-PS3-1) **SE/TE:** 218-221 **STEM:** *Designing Bird Feeders,* 13b **LS1.C: Organization for Matter and Energy Flow in Organisms** ▪ Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1) **SE/TE:** 218-221 **STEM:** *Designing Bird Feeders,* 13B, 14B	**Crosscutting Concepts** **Energy and Matter** ▪ Energy can be transferred in various ways and between objects. (5-PS3-1) **SE/TE:** 218-221 **STEM:** *Designing Bird Feeders,* 13B, 14B

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5-LS1 From Molecules to Organisms: Structures and Processes

5-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

5-LS1-1. 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.]

INTERACTIVE SCIENCE: Students gain understanding of plants use of water and air in Chapter 3, Lesson 3, "How do we classify plants?" on SE/TE page 103. Students **identify** the main idea and details about plants in #6, Review on page 115.

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

Science and Engineering Practices

Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Support an argument with evidence, data, or a model. (5-LS1-1)

Disciplinary Core Ideas

LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants acquire their material for growth chiefly from air and water. (5-LS1-1)

SE/TE: 103, 115

Crosscutting Concepts

Energy and Matter

- Matter is transported into, out of, and within systems. (5-LS1-1)

SE/TE: 103, 115

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5-LS2 Ecosystems: Interactions, Energy, and Dynamics

5-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
[Clarification Statement: Emphasis is on the idea that matter that is not food (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.]

INTERACTIVE SCIENCE: Students **learn** about the movement of matter through an ecosystem in modeled food chains and food webs in Chapter 6, Lesson 2, "How do organisms interact in ecosystems?" on SE/TE pages 217-221. In Differentiated Instruction on TE 219, students use index cards to **model** relationships in an ecosystem. Students **diagram** food chains in #7 on SE/TE page 221. In Science Notebook, students **draw** a prairie food web. In #11 on SE/TE page 223, students **describe** the food chain model. In STEM, *Designing Bird Feeders,* page 13B-14B, students **model** food chains in drawings.

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

Science and Engineering Practices

Developing and Using Models
Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions.
- Develop a model to describe phenomena. (5-LS2-1)

SE/TE: 217-221
STEM: *Designing Bird Feeders,* 13B, 14B

Connections to Nature of Science
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena
- Science explanations describe the mechanisms for natural events. (5-LS2-1)

SE/TE: 217-221
STEM: *Designing Bird Feeders,* 13B, 14B

Disciplinary Core Ideas

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. (5-LS2-1)

SE/TE: 217-221
STEM: *Designing Bird Feeders,* 13B, 14B

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. (5-LS2-1)

SE/TE: 217-221
STEM: *Designing Bird Feeders,* 13B, 14B

Crosscutting Concepts

Systems and System Models
- A system can be described in terms of its components and their interactions. (5-LS2-1)

SE/TE: 217-221
STEM: *Designing Bird Feeders,* 13B, 14B

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5-ESS1 Earth's Place in the Universe

5-ESS1 Earth's Place in the Universe		
Students who demonstrate understanding can: **5-ESS1-1. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.** [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).] **INTERACTIVE SCIENCE**: Students **gain understanding** of the relationship between the distance and brightness of the sun and stars on SE/TE pages 369 and 372. Students **support** an argument about the apparent brightness of stars in #9 on SE/TE page 373. **5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.** [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.] **INTERACTIVE SCIENCE**: Students **learn** about the seasonal and daily patterns caused by the motion of Earth in Chapter 9, Lesson 1, "How does Earth move?" on SE/TE page 366-367.On TE page 366, 21st Century Learning, students **represent** seasonal details in a graphic display. Students **measure** and **record** shadows throughout the day in Lightning Lab on SE/TE page 370. Students **gain understanding** of patterns in the apparent motion of stars in Lesson 2, SE/TE page 373.		
The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:		
Science and Engineering Practices **Analyzing and Interpreting Data** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. ▪ Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2) **SE/TE:** 366, 370 **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ▪ Support an argument with evidence, data, or a model. (5-ESS1-1) **SE/TE:** 369, 370, 372	**Disciplinary Core Ideas** **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. (5-ESS1-1) **SE/TE:** 369, 372, 373 **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. (5-ESS1-2) **SE/TE:** 366-367, 370, 373	**Crosscutting Concepts** **Patterns** ▪ Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2) **SE/TE:** 366-367, 373 **Scale, Proportion, and Quantity** ▪ Natural objects exist from the very small to the immensely large. (5-ESS1-1) **SE/TE:** 369, 372

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5-ESS2 Earth's Systems

5-ESS2 Earth's Systems

Students who demonstrate understanding can:

5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

INTERACTIVE SCIENCE: Students **learn** about changes in barometric pressure with elevation in Chapter 7, Lesson 3, "What is weather?" on SE/TE page 270. The effects of latitude, bodies of water, and mountains and other higher elevations on climate are presented in Lesson 5, "What is climate?" on SE/TE pages 286-287. Students **develop a model** of climate based on latitude and topography in Lightning Lab on SE/TE page 286. Students **name** factors that have effects on climate in #8 on SE/TE 287. Students **gain understanding** of erosion by water as an interaction between hydrosphere and geosphere in Chapter 8, Lesson 4, "What are erosion and deposition?" on SE/TE pages 324-325

5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]

INTERACTIVE SCIENCE: Students **gain knowledge** about the hydrosphere in Chapter 7, Lesson 2, "What is the ocean?" on SE/TE pages 264-267. In #2 on SE/TE page 265, students **graph** the amount of Earth's surface that is covered by ocean.

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

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model using an example to describe a scientific principle. (5-ESS2-1)

SE/TE: 264-267, 269-275, 282-287

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)

SE/TE: 265

Disciplinary Core Ideas

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. (5-ESS2-1)

SE/TE: 270, 286-287, 291-294

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. (5-ESS2-2)

SE/TE: 264-267

Crosscutting Concepts

Scale, Proportion, and Quantity

- Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2)

SE/TE: 265

Systems and System Models

- A system can be described in terms of its components and their interactions. (5-ESS2-1)

SE/TE: 264-267, 269-275, 282-287

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5-ESS3 Earth and Human Activity

5-ESS3 Earth and Human Activity		
Students who demonstrate understanding can: **5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.** **INTERACTIVE SCIENCE**: Students **obtain information** about scientific ideas to protect Earth's resources and environment "Changes caused by Humans" on SE/TE page 227 and in Chapter 6, Lesson 4, "How do humans impact ecosystems?" on SE/TE pages 233-235. Students **describe** changes to the environment caused by humans in #6, SE/TE page 227. Students **describe** how pollution affects organisms in #1 on SE/TE page 233. Students **research** and **write** a brochure about non-native species in the "Go Green" activity on SE/TE page 234. In 21st Century Learning, students **combine information** of choices people make that help ecosystems. In Lesson Check, TE page 235b, students **apply** the concepts of protecting ecosystems. Students **obtain information** about protecting Earth's environment in STEM, *Designing a Greener Cleaner*, 1G-e, 1G-g. Students **create** a healthier, Earth-friendly cleaner in Time to Clean Green, STEM pages 5G-12G.		
The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:		
Science and Engineering Practices **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. ▪ Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1) **SE/TE:** 234	**Disciplinary Core Ideas** **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. (5-ESS3-1) **SE/TE:** 227, 233-235 **STEM:** *Designing a Greener Cleaner,* TE pages 1G-e, 1G-g, 5G-12G	**Crosscutting Concepts** **Systems and System Models** ▪ A system can be described in terms of its components and their interactions. (5-ESS3-1) **SE/TE:** 233-235 **----------** **Connections to Nature of Science** **Science Addresses Questions About the Natural and Material World.** ▪ Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1) **SE/TE:** 233-235

3-5-ETS1 Engineering Design

3-5-ETS1 Engineering Design

Pearson Project STEM Grade 3-5 Titles:

- *Building for Erosion Control*
- *Designing a Greener Cleaner*
- *Designing Bird Feeders*
- *Building a Spirometer*
- *Building a Super Sneaker*
- *Designing Bridges*

Students who demonstrate understanding can:

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

INTERACTIVE SCIENCE Grades 3-5

Students **define a simple design problem** in Grades 3-5 Chapter 2 content cited below.

Grade 3: Try It!, SE/TE page 48, Explore It!, SE/TE page 54, SE/TE page 62; Modify Your Own Investigation TE page 67c, Design Your Own Investigation, TE page 67d

Grade 4: Elaborate, TE page 56; Science Notebook, TE page 58; SE/TE page 56; Lesson Check, #6, TE page 61b; Design Your Own Investigation, TE page 63d; Unit A Performance-based Assessment, SE page 78/TPG page 46

Grade 5: Try It!, SE/TE page 46; SE/TE page 62; Design Your Own Investigation, TE page 69d; Design It!, SE/TE page 78-79

Project Stem Grades 3-5

Students **define** river erosion as a design problem in STEM *Building for Erosion Control,* page 5E. Students **define** a "green" cleanser as a design problem on STEM *Designing a Greener Cleaner* page 5G. They **define** a better bird feeder as a design problem on STEM *Designing Bird Feeders* page 5B. Students **define** a spirometer as a design problem on STEM *Building a Spirometer* page 4S. They **define** a better athletic shoe as a design problem on STEM *Building a Super Sneaker,* page 5S. Students **define** a forty centimeter long bridge as a design problem on STEM *Designing Bridges* page 7B.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

INTERACTIVE SCIENCE Grades 3-5

Students **generate and compare possible solutions** in Grades 3-5 Chapter 2 content cited below.

Grade 3: Try It!, SE/TE page 48; Explore It!, SE/TE page 54; Explore It!, SE/TE page 60, SE/TE page 83; Investigate It!, SE/TE pages 66; Modify Your Own Investigation TE page 67c, Design Your Own Investigation, TE page 67d

Grade 4: Try It!, SE/TE page 46; Explore It!, SE/TE page 54; SE/TE page 57-58; Investigate It!, SE/TE page 62; Modify Your Investigation, TE page 63c, Design Your Own Investigation, TE page 63d; Unit A Performance-based Assessment, SE page 78/TPG page 46

Grade 5: Try It!, SE/TE page 46; Explore It!, SE/TE page 48; Go Green, SE/TE page 63-64; Lesson Check, #5, TE page 67b; Investigate It!, SE/TE pages 68-69; Modify Your Investigation, TE page 69c, Design Your Own Investigation, TE page 69d; Design It!, SE/TE page 79-81; Unit A Performance-based Assessment, SE page 84/TPG page 48.

Project Stem Grades 3-5

Grade 3: Students **research** and **generate** possible solutions to river erosion on STEM *Building for Erosion Control* pages 5E-6E. They **research** and **generate** possible recipes for a "green" cleanser on STEM *Designing a Greener Cleaner* pages 5G-7G. Students **research** and **generate** possible designs for a better bird feeder on STEM *Designing Bird Feeders* pages 5B-7B. They **research** and **generate** possible designs of a spirometer on STEM *Building a Spirometer,* pages 4S-7S. Students **research** and **generate** possible recipes for a better athletic shoe on STEM *Building a Super Sneaker,* pages 5S-7S. They also **research** and **generate** possible designs for a bridge on STEM *Designing Bridges* pages 7S-8S.

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3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

INTERACTIVE SCIENCE Grades 3-5

Students **plan and carry out tests** to identify aspects that can be improved in Grades 3-5 Chapter 2 content cited below.
Grade 3: Try It!, SE/TE page 48; Explore It!, SE/TE page 60; SE/TE page 63-65; Lesson Check, #5, TE 65b; Investigate It!, SE/TE pages 67; Modify Your Own Investigation TE page 67c, Design Your Own Investigation, TE page 67d
Grade 4: Try It!, SE/TE page 46; Explore It!, SE/TE page 54; SE/TE page 59-61, Got It? #13; Investigate It! SE/TE page 63; Modify Your Investigation, TE page 63c, Design Your Own Investigation, 63d
Grade 5: Try It!, SE/TE page 46; Explore It!, SE/TE page 48; Explore It!, SE/TE page 60; SE/TE page 64-65; Lesson Check, #3, #4, TE page 67b; Investigate It!, SE/TE pages 68-69; Modify Your Investigation, TE page 69c, Design Your Own Investigation, TE page 69d; Design It!, SE/TE page 82-83; Unit A Performance-based Assessment, SE page 84/TPG page 48.

Project Stem Grades 3-5

Students **construct** a prototype of an erosion restraint, **test** the prototype, and **identify** ways that it can be improved on STEM *Building for Erosion Control*, pages 7E-8E. They **make** a prototype a "green" cleanser, **test** the prototype, and **identify** ways that it can be improved on STEM *Designing a Greener Cleaner*, pages 7G-8G. Students **make** a prototype bird feeder, **test** the prototype, and **identify** ways that it can be improved on STEM *Designing Bird Feeders,* pages 7B-8B. Students **make** a prototype spirometer, **test** the prototype, and **identify** ways that it can be improved on STEM *Building a Spirometer,* pages 7S-8S. They **make** a prototype athletic shoe, **test** the prototype, and **identify** ways that it can be improved on STEM *Building a Super Sneaker,* pages 7S-8S. Students **make** a prototype of a bridge, **test** the prototype, and **identify** ways that it can be improved on STEM *Designing Bridges,* pages 9B-10B.

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

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.
- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)

Grade 3-5 STEM: *Building for Erosion Control* , 5E; *Designing A Greener Cleaner,* 5G; *Designing Bird Feeders,* 5B; *Building a Spirometer*, 4S; *Building a Super Sneaker,* 5S; *Designing Bridges,* 7B

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3)

Grade 3-5 STEM: *Building for Erosion Control* , 5E; *Designing A Greener Cleaner,* 5G; *Designing Bird Feeders,* 5B; *Building a Spirometer*, 4S; *Building a Super Sneaker,* 5S; *Designing Bridges,* 7B

Disciplinary Core Ideas

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. (3-5-ETS1-1)

Grade 3-5 STEM: *Building for Erosion Control,* 5E; *Designing A Greener Cleaner,* 5G; *Designing Bird Feeders,* 5B; *Building a Spirometer*, 4S; *Building a Super Sneaker,* 5S; *Designing Bridges,* 7B

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. (3-5-ETS1-2)

Grade 3-5 STEM: *Building for Erosion Control,* 5E-6E; *Designing A Greener Cleaner,* 5G-6G; *Designing Bird Feeders,* 5B-7B; *Building a Spirometer*, 4S-5S; *Building a Super Sneaker,* 5S-6S; *Designing Bridges,* 7B-8B

Crosscutting Concepts

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. (3-5-ETS-1)

Grade 3-5 STEM: *Building for Erosion Control,* 5E; *Designing A Greener Cleaner,* 5G; *Designing Bird Feeders,* 5B; *Building a Spirometer*, 4S; *Building a Super Sneaker,* 5S; *Designing Bridges,* 7B

- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS-2)

Grade 3-5 STEM: *Building for Erosion Control,* 5E-6E; *Designing A Greener Cleaner,* 5G-6G; *Designing Bird Feeders,* 5B-7B; *Building a Spirometer*, 4S-5S; *Building a Super Sneaker,* 5S-6S; *Designing Bridges,* 7B-8B

Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. ▪ Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2) **Grade 3-5 STEM:** *Building for Erosion Control,* 5E-6E; *Designing A Greener Cleaner,* 5G-6G; *Designing Bird Feeders,* 5B-7B; *Building a Spirometer*, 4S-5S; *Building a Super Sneaker,* 5S-6S; *Designing Bridges,* 7B-8B	▪ 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. (3-5-ETS1-2) **Grade 3-5 STEM:** *Building for Erosion Control,* 5E-6E; *Designing A Greener Cleaner,* 5G-6G; *Designing Bird Feeders,* 5B-7B; *Building a Spirometer*, 4S-5S; *Building a Super Sneaker,* 5S-6S; *Designing Bridges,* 7B-8B ▪ Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3) **Grade 3-5 STEM:** *Building for Erosion Control,* 7E-8E; *Designing A Greener Cleaner,* 7G-8G; *Designing Bird Feeders,* 7B-8B; *Building a Spirometer*, 7S-8S; *Building a Super Sneaker,* 7S-8S; *Designing Bridges,* 9B-10B **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. (3-5-ETS1-3) **Grade 3-5 STEM:** *Building for Erosion Control,* 5E; *Designing A Greener Cleaner,* 5G; *Designing Bird Feeders,* 5B; *Building a Spirometer*, 4S; *Building a Super Sneaker,* 5S; *Designing Bridges,* 7B	