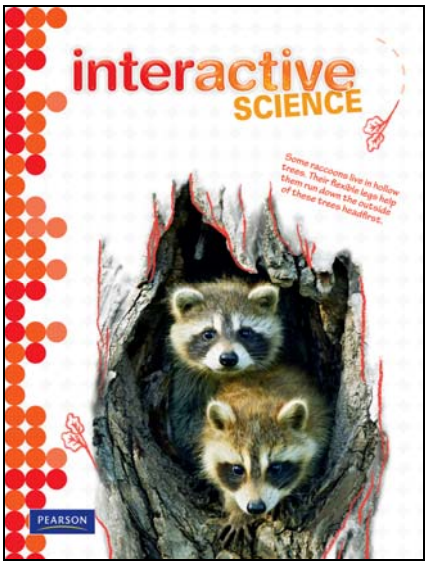
A Correlation of

Pearson
Interactive Science
Grade 4, ©2012



To the

Next Generation Science Standards

DRAFT, MAY 2012

Grade 4

A Correlation of
Pearson Interactive Science ©2012
to the Next Generation Science Standards – DRAFT, May 2012
Grade 4

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 first draft of the Next Generation Science Standards (NGSS). Correlation references are to the Student Edition, Teacher Edition, and STEM Activity Book.

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Grade 4

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GRADE 4

4.LCT.a. Life Cycles and Traits

Students who demonstrate understanding can:

a. Investigate the life cycles of plants and animals to compare similarities and differences among organisms. [Clarification Statement: Examples of organisms to compare could be flowering plants, butterflies, and frogs.] [*Assessment boundary: Reproduction is addressed as part of the process – birth, growth, development, reproduction, death – and the different ways organisms go through the process.*]

INTERACTIVE SCIENCE: This concept is taught is at *Interactive Science* middle school module, *Diversity of Life*, Chapter 3, Lesson 4 (plants) and Chapter 7, Lesson 1 (animals). The citations below indicate areas where this idea is introduced at this grade level.

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

Planning and Carrying Out Investigations	**LS1.B: Growth and Development of Organisms**	**Patterns**
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and measurements, collect data, and identify patterns that will provide evidence for explaining phenomena. **TE Only:** 87, 21st Century Learning; 89, Differentiated Instruction; 91, Differentiated Instruction	• Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles that include being born (sprouting in plants), growing, developing into adults, reproducing, and eventually dying. **SE/TE:** 87, Reproduction; 93, Plants That Make Seeds; 94-95, Parts of a Flower; 96, Pollen on the Move; 97, After Pollination; 98, Lightning Lab, Seeds on the Move; 99, Life Cycle of a Plant, Got it?, #10-12; 134-#2, Chapter Review; 136-#6, Benchmark Practice **TE Only:** 94, Differentiated Instruction, Interactive Whiteboard Ready; 96, Science Notebook, Science to Writing; 97, Differentiated Instruction; 98, Science Notebook; 99, RTI; 99b-#1-6, Lesson Check; 135a-135b-#5, 8, 9; Chapter Test	Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena and designed products. Cyclic patterns of change related to time can be used to make predictions. **SE/TE:** 93, Plants That Make Seeds **TE Only:** 87, 21st Century Learning; 89, Differentiated Instruction; 98, Science Notebook; 135a-#1, Chapter Test

4.LCT.b. Life Cycles and Traits

Students who demonstrate understanding can:

b. Use evidence to compare characteristics inherited from parents, characteristics caused by the environment, and those resulting from both. [Clarification Statement: Examples of characteristics inherited from parents could be the ability to roll one's tongue or characteristics of domestic animals; characteristics caused by the environment could be a scar or language; and characteristics resulting from both could be height or some health conditions.] [*Assessment Boundary: The mechanisms of inheritance are not to be included.*]

INTERACTIVE SCIENCE: Information about characteristics inherited from parents, characteristics caused by the environment, and those resulting from both are located in Chapter 3, Lessons 4 through 6. In Adaptations, SE/TE: 107, students **list** and **explain** inherited characteristics of a snowshoe hare. In Differentiated Instruction, TE: 108, students **compare** and **contrast** animal adaptations. On SE/TE: 109, #5, students **observe** and **compare** how characteristics of a number of organisms are adapted to its environment. In the Got it? feature on SE/TE: 111, #8, 9, students **describe** characteristics that a cactus and a duck inherits. In the Explore It! activity on SE/TE page 112, students **play** a matching game in which they determine if a characteristic is inherited or caused by the environment. The Learned Behavior lesson on TE: 122 asks students to **differentiate** between instincts and learned behaviors. Students are asked to **predict** how a cub's behavior is affected if it is separated from its parents after birth. In the Learning and Instinct Combined Lesson, SE/TE: 123, students **classify** behavior, #9. In Differentiated Instruction, TE: 123, students **cite** evidence of how some behaviors are partially instinctive and partially learned. In Science Careers, SE/TE: 126, students **respond** to whether a captive environment will affect a bird's migration behavior. In Lesson Check, TE: 111b, #2, 4, 5, 6, students **provide** evidence of vocabulary and content knowledge.

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

Constructing Explanations and Designing Solutions	**LS3.A: Inheritance of Traits**	**Cause and Effect**
Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing multiple explanations and designing multiple solutions. • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or solution to a problem. **SE/TE:** 116, Lightning Lab **Related Content, TE Only:** 122, 21st Century Learning	• Many characteristics of organisms are inherited from their parents. Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. **SE/TE:** 107, Adaptations; 108-109, Animal Adaptations; 110-111, Plant Adaptations; 111, Got it?; 112, Explore It!; 113, Characteristics of Living Things; 114-115 Inherited Characteristics; 116, Lightning Lab; 116-117, Parents, Offspring, and Advantages; 117, Got it?; 119, Animal Behaviors; 120-121, Animal Instincts; 122-123, Learned Behavior; 123, Got it?; 134-135, #4-8; 136-#4, Benchmark Practice; **TE Only:** 108, Science Notebook, Differentiated Instruction; 110, Science Notebook; 111, RTI; 111b-#1-5, Lesson Check; 113, ELL Support; 114, Science to Writing; 115, Differentiated Instruction; 116, Science Notebook; 117, RTI; 117b-#1-6, Lesson Check; 119, ELL Support; 122, Science Notebook,	Cause and effect relationships are routinely identified, tested, and used to explain change. Events that occur together with regularity might or might not be a cause and effect relationship. **SE/TE:** 107, Adaptations; 112, Explore It!; 116-117, Parents, Offspring, and Advantages; 119, Animal Behaviors; 120-121, Animal Instincts; 122, Learned Behavior; 123, Got it?; 134-135, #4; 126, Science Careers, Apply the Big Question **TE Only:** 116, Science Notebook; 122, Science Notebook

	Science to Writing; 123, Differentiated Instruction, RTI; 123b-#1-6, Lesson Check; 135a-135b-#2-3, 6-7, 10; Chapter Test **LS3.B: Variation of Traits** • The environment also affects the traits that an organism develops—differences in where they grow or in the food they consume may cause organisms that are related to end up looking or behaving differently. **SE / TE**: 107, Adaptations	

4.LCT.c. Life Cycles and Traits

Students who demonstrate understanding can:

c. Provide evidence that offspring can inherit different information from their parents. [Clarification Statement: Examples of different information that can be inherited could be different coat colors in dogs of the same litter or one sibling who needs glasses and another who does not.] [*Assessment Boundary: The genetic mechanisms of inheritance are not to be included.*]

INTERACTIVE SCIENCE: Chapter 3, Lesson 5 explores offspring that inherit different information from their parents. On SE/TE: 113, information about Mendel's experiments with bean plants' inherited variations is presented. On SE/TE: 115, Human Beings, the teacher side notes direct students to **generalize** and **infer** about a child's inherited characteristics. In Lightning Lab, SE/TE: 116, students **provide** evidence that offspring can inherit different information from their parents by **conducting** a dimple survey.

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

Engaging in Written and Oral Argument from Evidence Engaging in argument from evidence in 3–5 builds from 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. • Support scientific arguments drawing on evidence, data, or a model. **SE/TE:** 116, Lightning Lab	**LS3.B: Variation of Traits** • Offspring acquire a mix of traits from their biological parents. Different organisms vary in how they look and function because they have different inherited information. In each kind of organism there is variation in the traits themselves, and different kinds of organisms may have different versions of the trait. **SE/TE:** 107, Adaptations; 113, Characteristics of Living Things; 114-115, Inherited Characteristics; 116, Lightning Lab; 116-117, Parents, Offspring, and Advantages; 117, Got it?, #12 **TE Only:** 113, ELL Support; 114, Science to Writing; 117, ELL Support, RTI; 117b-#1, 3, 6	**Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change. Events that occur together with regularity might or might not be a cause and effect relationship. **SE/TE:** 113, Characteristics of Living Things; 114-115, Inherited Characteristics; 116, Lightning Lab; 116-117, Parents, Offspring, and Advantages **TE Only:** 114, Science to Writing;117, ELL Support

4.LCT.d. Life Cycles and Traits

Students who demonstrate understanding can:

d. Obtain and communicate information about different versions of the same traits in different kinds of organisms. **[Clarification Statement: Examples of different kinds of animals having different versions of the same trait could include the different lengths, textures, and colors of feathers, hair, or fur of different animals.] [*Assessment Boundary: The genetic mechanisms of inheritance are not to be included.*]**

INTERACTIVE SCIENCE: This concept is taught in Pearson *Interactive Science* middle school module, *Diversity of Life*. The citations below indicate areas in *Interactive Science* where this idea is introduced at this grade level.

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

Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 and progresses to evaluating the merit and accuracy of ideas and methods. • Compare and synthesize across texts and other reliable media to acquire and generate appropriate scientific information. • Generate and communicate scientific information orally and in written formats using various forms of media and may include tables, diagrams, and charts.	**LS3.B: Variation of Traits** • Offspring acquire a mix of traits from their biological parents. Different organisms vary in how they look and function because they have different inherited information. In each kind of organism there is variation in the traits themselves, and different kinds of organisms may have different versions of the trait. **SE/TE:** 113, Characteristics of Living Things; 114-115, Inherited Characteristics; 116-117, Parents, Offspring, and Advantages; Lightning Lab; 117, Got it?, #10 **TE Only:** 113, ELL Support; 114, Science to Writing; 117, ELL Support	**Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change. Events that occur together with regularity might or might not be a cause and effect relationship. **SE/TE:** 113, Characteristics of Living Things; 114-115, Inherited Characteristics; 116, Lightning Lab; 116-117, Parents, Offspring, and Advantages **TE Only:** 114, Science to Writing

4.LCT.e. Life Cycles and Traits

Students who demonstrate understanding can:

e. Use evidence to describe patterns of variation in a trait across individuals of the same kind of organism.
[Clarification Statement: Examples of variation in a trait across individuals of the same kind of organism could be different coloration of wolves or thickness of wool in sheep.] [*Assessment Boundary: The genetic mechanisms of inheritance are not to be included.*]

INTERACTIVE SCIENCE: Information about inherited traits is found in Chapter 3, Lesson 5. Students learn about variations in traits within human beings in SE/TE: 115. Students **summarize** three characteristics that an organism inherited and students **write** a characteristic that they may have inherited their parents. In SE/TE: 116-117, Parents, Offspring, and Advantages, students **obtain** information about variations in the inherited trait of neck length in giraffes and in color of peppered moths. In the Lightning Lab feature, students **survey** their classmates about dimples and **create** a chart of the data. Students **demonstrate** content knowledge in the Chapter Review, SE/TE: 135, #5-7.

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

Constructing Explanations and Designing Solutions	**LS3.B: Variation of Traits**	**Patterns**
Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing multiple explanations and designing multiple solutions. • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or solution to a problem. **SE/TE:** 116, Lightning Lab	• Offspring acquire a mix of traits from their biological parents. Different organisms vary in how they look and function because they have different inherited information. In each kind of organism there is variation in the traits themselves, and different kinds of organisms may have different versions of the trait. **SE/TE:** 113, Characteristics of Living Things; 114-115, Inherited Characteristics; 116, Lightning Lab; 116-117, Parents, Offspring, and Advantages; 117, Got it?, #12;135, Chapter Review, #5-7 **TE Only:** 113, ELL Support; 114, Science to Writing; 117, ELL Support; 117b, Lesson Check, #2, 4, 6	Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena and designed products. Cyclic patterns of change related to time can be used to make predictions. **SE/TE:** 113, Characteristics of Living Things; 114-115, Inherited Characteristics; 116, Lightning Lab; 116-117, Parents, Offspring, and Advantages **TE Only:** 113, ELL Support; 114, Science to Writing; 117, ELL Support

4.LCT.f. Life Cycles and Traits

Students who demonstrate understanding can:

f. Use evidence to explain how some characteristics that vary among individuals of the same kind of organism can provide advantages to survive, find mates, and reproduce. [Clarification Statement: Examples of advantages could include animals that run faster are better escape predators or birds with brighter colored feathers are more likely to attract mates.]

INTERACTIVE SCIENCE: Chapter 3, Lesson 5 explores how some characteristics that vary among individuals of the same kind of organism provide advantages to survive, find mates, and reproduce. On SE/TE: 116, Parents, Offspring, and Advantages, students **learn** about variation in the inherited trait of neck length in giraffes, how this is an advantage, and **infer** how this occurred, #9. In the TE side notes, Science Notebook, students **consider** this variation in giraffes and **write** why this would be a preferred trait. On SE/TE: 117, students **explore** a variation in the inherited trait of color in peppered moths and **summarize** how this gives them an advantage, #10. In Got it? #11, students **apply** their knowledge and **determine** a physical characteristic that would give a hawk an advantage.

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

Constructing Explanations and Designing Solutions	**LS4.B: Natural Selection**	**Cause and Effect**
Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing multiple explanations and designing multiple solutions. • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or solution to a problem.	• Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. **SE/TE:** 116-117, Parents, Offspring, and Advantage; 117, Got it?, #11	Cause and effect relationships are routinely identified, tested, and used to explain change. Events that occur together with regularity might or might not be a cause and effect relationship. **SE/TE:** 116-117, Parents, Offspring, and Advantage; 117, Got it? **TE Only:** 116, Science Notebook; 117, ELL Support

4.LCT.g. Life Cycles and Traits

Students who demonstrate understanding can:

g. Obtain information to explain how breeders use variations in traits to produce desired types of domesticated organisms. [Clarification Statement: Examples could be sheep that are bred for thicker wool coats or disease resistant corn that is used in cultivation.]

INTERACTIVE SCIENCE: This concept is taught in Pearson *Interactive Science* middle school module, *Cells and Heredity*, Chapter 5, Lesson 3.

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

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 multiple explanations and designing multiple solutions. • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or solution to a problem. **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 3–5 builds on K–2 and progresses to evaluating the merit and accuracy of ideas and methods. • Compare and synthesize across texts and other reliable media to acquire and generate appropriate scientific information.	**LS4.B: Natural Selection** • Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.	***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** People's needs and wants change over time, as do their demands for new and improved technologies. Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. When new technologies become available, they can bring about changes in the way people live and interact with one another.

4.LCT.h. Life Cycles and Traits

Students who demonstrate understanding can:

h. Obtain and communicate information that some characteristics of organisms have been used to inspire technology that meets societal needs. [Clarification Statement: Students could identify technologies that utilize advantageous characteristics of organisms such as: sonar, insulated vests, camouflage fatigues, Velcro.] [*Assessment boundary: Mechanisms of production not included at this grade band. Focus is on utility only.*]

INTERACTIVE SCIENCE: This concept is not taught in *Interactive Science*. The citations below indicate areas in the program where this idea is introduced at this grade level.

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

Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 and progresses to evaluating the merit and accuracy of ideas and methods. • Compare and synthesize across texts and other reliable media to acquire and generate appropriate scientific information. • Generate and communicate scientific information orally and in written formats using various forms of media and may include tables, diagrams, and charts.	**LS4.B: Natural Selection** • Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. **ETS2.B: Interactions of Engineering, Technology, Science, Society, and the Natural Environment** • Over time, people's needs and wants change as do their demands for new and improved technologies.	**Connections to Engineering, Technology, and Applications of Science** **Influence of Engineering, Technology, and Science on Society and the Natural World** People's needs and wants change over time, as do their demands for new and improved technologies. Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. When new technologies become available, they can bring about changes in the way people live and interact with one another. **TE only:** 98, 21st Century Learning

4.PSE.a. Processes that Shape the Earth

Students who demonstrate understanding can:

a. Ask testable questions about the effects of moving water on the rate of erosion under various conditions and plan and carry out investigations to observe and document the effects. [Clarification Statement: Examples of variables to test could be angle of slope, amount of vegetation, or volume of flow.] [*Assessment Boundary: Ratios should not be included in quantitative analysis.*]

INTERACTIVE SCIENCE: Information about the effects of moving water on the rate of erosion under various conditions is presented in Chapter 5, Lesson 3. In the At-Home Lab on SE/TE: 222, students **observe** how different speeds of water flow effect erosion. In STEM: 1-4, Activity 1, Hold Back the Water, students **explain** the problem of riverbank erosion. Students **design** and **construct** a model to infer how water erodes a river bank. Students **carry out** the investigations, **communicate** the results, and **evaluate** and **redesign** the prototype. In the Apply It! activity on SE: 296/TPG: 58, students **ask** a testable question and **investigate** the way soil erosion is affected by the amount of water. Students **observe** that a greater amount of erosion occurs when a greater amount of water falls on the soil.

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

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

- Identify scientific (testable) and non-scientific questions.

SE/TE: 296, Apply It!

TE Only: 223, Differentiated Instruction

STEM: 1, Activity 1, Hold Back the Water

TPG: 58, Apply It!

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 carry out investigations collaboratively, using fair tests in which variables are controlled and the number of trials considered.

SE/TE: 222, At-Home Lab; 296-299, Apply It!

STEM: 1-4, Activity 1, Hold Back the Water

TPG: 58-61, Apply It

- Make observations and measurements,

ESS1.C: The History of Planet Earth

- Earth has changed over time. Understanding how landforms develop, are weathered (broken down into smaller pieces), and erode (get transported elsewhere) can help to infer the history of the current landscape.

SE/TE: 219, Earth's Surface; 220, Weathering; 221, Physical Weathering, Challenge, #3; 222, At-Home Lab, Erosion; 223, Got it?, #7, 8; 247-248, 250, Chapter Review, #4; Vocabulary Smart Cards; 296-299, Apply It!

TE Only: 221, Science Notebook; 222, Science Notebook; 223, Differentiated Instruction, RTI; 223b-#1-6; Lesson Check

STEM: 1-4, Activity 1, Hold Back the Water

TPG: 58-61, Apply It

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.

SE/TE: 220, Weathering; 221, Physical Weathering, Challenge #3; Erosion; 223, Got it?, #8

Cause and Effect
Cause and effect relationships are routinely identified, tested, and used to explain change. Events that occur together with regularity might or might not be a cause and effect relationship.

SE/TE: 220, Weathering; 221, Physical Weathering; 222, At-Home Lab, Erosion; 223, Got it?; 296-299, Apply It!

TE Only: 221, Science Notebook; 222, Science Notebook; 223, Differentiated Instruction, RTI; 223b, #1-6; Lesson Check

STEM: 1-4, Activity 1, Hold Back the Water

TPG: 58-61, Apply It

collect appropriate data, and identify patterns that provide evidence to explain a phenomenon or test a design solution. **SE/TE:** 222, At-Home Lab; 296-299, Apply It! **STEM:** 1-4, Activity 1, Hold Back the Water **TPG:** 58-61, Apply It!	**TE Only:** 221, Science Notebook; 222, Science Notebook; 223b-#1, 6; Lesson Check **ESS2.C: The Roles of Water in Earth's Surface Processes** • The downhill movement of water as it flows to the ocean shapes the appearance of the land. **SE/TE:** 219, Earth's Surface	

4.PSE.b. Processes that Shape the Earth

Students who demonstrate understanding can:

b. Obtain and communicate information about how patterns in tree rings and ice cores are used as evidence to describe the recent history of Earth's climate. [*Assessment Boundary: Students are not to be assessed on their understanding of deep time.*]

INTERACTIVE SCIENCE: This concept is taught in Pearson *Interactive Science* middle school module, *Water and the Atmosphere*, Chapter 5, Lesson 3.

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

Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 and progresses to evaluating the merit and accuracy of ideas and methods. • Compare and synthesize across texts and other reliable media to acquire and generate appropriate scientific information. • Generate and communicate scientific information orally and in written formats using various forms of media and may include tables, diagrams, and charts.	**ESS1.C: The History of Planet Earth** • Patterns of tree rings and ice cores from glaciers can help reconstruct Earth's recent climate history.	**Patterns** Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena and designed products. Cyclic patterns of change related to time can be used to make predictions.

4.PSE.c. Processes that Shape the Earth

Students who demonstrate understanding can:

c. Use evidence to explain how the physical characteristics of local areas are affected by the processes of weathering and erosion, including the activities of living organisms. [Clarification Statement: Examples of activities of living organisms could be tree planting, beaver dams, or human-built dams and waterways.]

INTERACTIVE SCIENCE: Chapter 5, Lesson 3 explores how the physical characteristics of local areas are affected by the processes of weathering and erosion. In Science Notebook, TE: 221, students **identify** examples of chemical and physical weathering in their neighborhood. On SE/TE: 222 students **draw a conclusion** about what a muddy river tells about erosion. In Lesson Check, TE: 223b, students **apply** concepts, #6, as they **explain** an illustration of a man made barrier. In STEM: 1-4, Activity 1, Hold Back the Water, students **research** and use evidence to **design, construct,** and **test** a water bank reinforcement. In Chapter Test, TE: 251b, #9, 10, students **explain** landforms caused by erosion and deposition. In Performance-Based Assessment, SE: 196/TPG: 54, students **make** a presentation of how dams affect the environment.

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

Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds from 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. • Construct and support scientific arguments drawing on evidence, data, or a model. **SE/TE:** 221, Physical Weathering, #3; 222, At-Home Lab; 196, Performance-Based Assessment, Make a Presentation **Related Content, TE Only:** 223a, Explore It!; 223b, #6, Lesson Check **STEM:** 1-4, Activity 1, Hold Back the Water **TPG:** 54, Performance-Based Assessment, Make a Presentation	**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. **SE/TE:** 220, Weathering; 221, Physical Weathering, Challenge #3; Erosion; 223, Got it?, #8 **TE Only:** 221, Science Notebook; 222, Science Notebook; 223b, #1, 6; Lesson Check **ESS2.E: Biogeology** • Living things affect the physical characteristics of their regions (e.g., plants' roots hold soil in place, beaver shelters and human-built dams alter the flow of water, plants' respiration affects the air). Many types of rocks and minerals are formed from the remains of organisms or are altered by their activities. **Related Content, SE/TE:** 167, Got it?, Unlock the Big Question, #8; 196, Performance-Based Assessment, Make a Presentation; **Related Content, TE Only:** 166, Science to Social Studies **TPG:** 54, Performance-Based Assessment, Make a Presentation	**Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change. Events that occur together with regularity might or might not be a cause and effect relationship. **SE/TE:** 222, At-Home Lab; 196, Performance-Based Assessment, Make a Presentation **Related Content, TE Only:** 221, Science Notebook **STEM:** 1-4, Activity 1, Hold Back the Water **TPG:** 54, Performance-Based Assessment, Make a Presentation

4.PSE.d. Processes that Shape the Earth

Students who demonstrate understanding can:

d. Use evidence to construct an explanation that some rocks and minerals are formed from the remains of organisms.

INTERACTIVE SCIENCE: Information about the formation of rocks and minerals from the remains of organisms is presented in Chapter 5, Lesson 2. Students **obtain** information about sedimentary rock on SE/TE: 213-214, and **compare and contrast** rock samples, #6. In TE side notes, students **cite** examples of types of sedimentary rocks and **write about the** differences between them. On SE/TE: 215, students **obtain** information about shale. In the TE side notes, Science Notebook and Differentiated Instruction, students **write** about the types of rocks, **write** equations as to how each type is formed, and **identify** rock samples.

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

Constructing Explanations and Designing Solutions	**LS4.A: Evidence of Common Ancestry and Diversity**	**Cause and Effect**
Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing multiple explanations and designing multiple solutions. • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or solution to a problem **TE Only:** 212, Differentiated Instruction; 213, Science Notebook; 215, Science Notebook, Differentiated Instruction; 217b, Lesson Check, #6 • Identify the evidence that supports an explanation. **SE/TE:** 179, Fossil Fuels **TE Only:** 213, Science Notebook; 215, Science Notebook, Differentiated Instruction	• Fossils provide evidence about the types of organisms (both visible and microscopic) that lived long ago and also about the nature of their environments. Fossils can be compared with one another and to living organisms according to their similarities and differences. **SE/TE:** 212-213, Sedimentary Rocks; #5, 6; 215, Shale **TE Only:** 212, Differentiated Instruction; 213, Science Notebook; 215, Science Notebook; Differentiated Instruction **ESS2.E: Biogeology** • Living things affect the physical characteristics of their regions (e.g., plants' roots hold soil in place, beaver shelters and human-built dams alter the flow of water, plants' respiration affects the air). Many types of rocks and minerals are formed from the remains of organisms or are altered by their activities. **SE/TE:** 212-213, Sedimentary Rocks; #5, 6; 215, Shale **TE Only: TE Only:** 213, Science Notebook; 215, Science Notebook; Differentiated Instruction	Cause and effect relationships are routinely identified, tested, and used to explain change. Events that occur together with regularity might or might not be a cause and effect relationship. **SE/TE:** 179, Fossil Fuels **TE Only:** 217b, Lesson Check, Apply Concepts, #6

4.PSE.e. Processes that Shape the Earth

Students who demonstrate understanding can:

e. Use evidence from the fossil record to construct an explanation for the relationship between types of organisms living today and types of organisms that lived in the past.

INTERACTIVE SCIENCE: Chapter 4, Lesson 6 explores the relationship between organisms living today and types of organisms that lived in the past. In Fossils and Living Organisms, SE/TE: 176, students **obtain information** about extinct and modern day organisms and **compare** them, #2. In the TE side notes, 21st Century Learning, students **gain understandings** of paleontologists and scientists goals as they **learn** problem identification, formulation, and solution. In Got it!, SE/TE: 179, #10, students **summarize** the value of knowledge from studying fossils. TE: 179b, Lesson Check, and Chapter Review, SE/TE: 189, #9, students **demonstrate** content knowledge as they **apply** concepts, #6.

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

Constructing Explanations and Designing Solutions	**LS4.A: Evidence of Common Ancestry and Diversity**	**Stability and Change**
Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing multiple explanations and designing multiple solutions. • Use quantitative relationships to construct explanations of observed events. (e.g., the distribution of plants in the back yard or why some things sink and others float.) **Related Content, SE/TE:** 140, Try It! Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or solution to a problem. **SE/TE:** 170-171, How Fossils Form; 173, Lightning Lab **TE Only:** 173, 21st Century Learning; 176, 21st Century Learning • Identify the evidence that supports an explanation. **Related Content, SE/TE:** 171, Identify, #4	• Fossils provide evidence about the types of organisms (both visible and microscopic) that lived long ago and also about the nature of their environments. Fossils can be compared with one another and to living organisms according to their similarities and differences. **SE/TE:** 176, Fossils and Living Organisms; 179, Got it?, #10; 189, Chapter Review, #9 **Related Content, SE/TE**: 168, My Planet Diary; 169, Fossil Clues; 170-171, How Fossil Form; 172-173, Other Types of Fossils; 177, Fossils and the Environment; 178, Fossil Age **TE Only:** 176, Science Notebook, 21st Century Learning; 179b, Lesson Check, #6 **Related Content, TE Only:** 173a, My Planet Diary; 177, Science to Writing;	Some stable systems are static while others change in different ways. Some systems appear stable, but over long periods of time will eventually change. **SE/TE:** 176, Fossils and Living Organisms; 177, Fossils and the Environment; 178, Fossil Age **TE Only:** 177, Science to Writing

4.PSE.f. Processes that Shape the Earth

Students who demonstrate understanding can:

f. Use evidence to construct explanations for how environments today may be different from past environments in which fossilized organisms once lived. [Clarification Statement: Examples of evidence of environments that have changed could be seashell fossils found on mountains or petrified wood found in deserts.]

INTERACTIVE SCIENCE: Information about fossils is found in Chapter 4, Lesson 6. In Fossils and the Environment on SE/TE: 177, students **obtain** the evidence for environmental change over 65 million years in present-day Kansas. In the Main Idea and Details exercise, #5, students **explain** what details support the idea that Earth's environment has changed. In the Got it? feature on SE/TE:179, students **draw conclusions** about a fossil of a sea creature that is found on a mountain top.

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

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 multiple explanations and designing multiple solutions. • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or solution to a problem. **TE Only:** 177, Science and Writing	**LS4.A: Evidence of Common Ancestry and Diversity** • Fossils provide evidence about the types of organisms (both visible and microscopic) that lived long ago and also about the nature of their environments. Fossils can be compared with one another and to living organisms according to their similarities and differences. **SE/TE:** 176, Fossils and Living Organisms; 177, Fossils and the Environment; 179, Got it?, #9, 10 **TE Only:** 172, Differentiated Instruction; 173, 21st Century Learning; 177, Science to Writing **ESS1.C: The History of Planet Earth** • Earth has changed over time. Understanding how landforms develop, are weathered (broken down into smaller pieces), and erode (get transported elsewhere) can help to infer the history of the current landscape. **SE/TE:** 177, Fossils and the Environment; 178, Fossil Age, 179, Got it?, #9, 10 **TE Only:** 177, Science to Writing	**Stability and Change** Some stable systems are static while others change in different ways. Some systems appear stable, but over long periods of time will eventually change. **SE/TE:** 177, Fossils and the Environment; 178-179, Fossil Age **TE Only:** 177, Science to Writing

4.PSE.g. Processes that Shape the Earth

Students who demonstrate understanding can:

g. Obtain information about the locations of a variety of Earth's features and map the geographic patterns that emerge. [Clarification Statement: Examples of features could be volcanoes and earthquakes that are often found at the boundaries of continents and the ocean floor or major mountain chains that often form near the edges of continents.]

INTERACTIVE SCIENCE: This concept is taught in Grade 5: Chapter 8, Lesson 5. The citations below indicate areas in *Interactive Science* where this idea is introduced at this grade level.

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

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.

- Construct and revise models collaboratively to measure and explain frequent and regular events.

Related Content, SE/TE: 229, Lightning Lab

STEM: 37-40, Activity 10, Did You Feel That?

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

- Compare and synthesize across texts and other reliable media to acquire and generate appropriate scientific information.
- Synthesize information in written text with that contained in corresponding tables, diagrams, and charts.

TE Only: 226, 21st Century Learning

- Use models to share findings in oral and written presentations, and extended discussions.

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.

SE/TE: 224, My Planet Diary; 225, Earth's Moving Plates, #1; 226, Volcanoes; 227, Earthquakes; 229, Got it?

Related Content, TE Only: 226, 21st Century Learning; 227, Science to Social Studies; 229a, My Planet Diary

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 where people live and in other areas of Earth.

SE/TE: 225, Earth's Moving Plates

Patterns
Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena and designed products. Cyclic patterns of change related to time can be used to make predictions.

SE/TE: 224, My Planet Diary

4.PSE.h. Processes that Shape the Earth

Students who demonstrate understanding can:

h. Analyze maps and other data to determine the likelihood of geological hazards occurring in an area and evaluate the possible effects on landforms and organisms. [*Assessment Boundary: Results of analysis and evaluation are qualitative.*]

INTERACTIVE SCIENCE: This concept is introduced in Grade 5: Chapter 8, Lesson 5. The citations below indicate areas in *Interactive Science* where this idea is introduced at this grade level.

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

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

- Display data in tables and graphs, using digital tools when feasible, to reveal patterns that indicate relationships.
- Use data to evaluate claims about cause and effect.
- Compare data collected by different groups in order to discuss similarities and differences in their findings.

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.

Related Content, SE/TE: 224, My Planet Diary; 227, Earthquakes, #4, 5

ETS1.B: Designing Solutions to Engineering Problems

- Research on a problem should be carried out—for example, through Internet searches, market research, or field observations—before beginning to design a solution. An often productive way to generate ideas is for people to work together to brainstorm, test, and refine possible solutions.

Related Content, SE/TE: 224, My Planet Diary

Related Content, TE only: 226, 21st Century Learning; 229a, My Planet Diary

Cause and Effect
Cause and effect relationships are routinely identified, tested, and used to explain change. Events that occur together with regularity might or might not be a cause and effect relationship.

Related Content, SE/TE: 224, My Planet Diary; 227, Earthquakes

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Grade 4

4.PSE.i. Processes that Shape the Earth

Students who demonstrate understanding can:

i. Construct models, based on research, to test and refine various design solutions for reducing the impacts of geological hazards.

INTERACTIVE SCIENCE: This concept is taught in Pearson *Interactive Science* middle school module, *Earth's Structure*, Chapter 4, Lesson 2. The citations below indicate areas in the program where this idea is introduced at this grade level.

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

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.

- Construct a model using an analogy, example, or abstract representation to explain a scientific principle.

STEM: 37-40, Activity 10, Did You Feel That?

- Use simple models to describe phenomena and test cause and effect relationships concerning the functioning of a natural or designed system.

STEM: 1-4, Activity 1, Hold Back the Water; 37-40, Activity 10, Did You Feel That?

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.

STEM: 1-4, Activity 1, Hold Back the Water; 37-40, Activity 10, Did You Feel That?

ETS1.B: Designing Solutions to Engineering Problems

- Research on a problem should be carried out—for example, through Internet searches, market research, or field observations—before beginning to design a solution. An often productive way to generate ideas is for people to work together to brainstorm, test, and refine possible solutions.

Related Content, STEM: 1-4, Activity 1, Hold Back the Water

Testing a solution involves investigating how well it performs under a range of likely conditions.

- Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. 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.

STEM: 1-4, Activity 1, Hold Back the Water; 37-40, Activity 10, Did You Feel That?; 41-44, Activity 11, Time to Clean Green!

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World
People's needs and wants change, as do their demands for new and improved technologies. Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. When new technologies become available, they can bring about changes in the way people live and interact with one another.

STEM: 1-4, Activity 1, Hold Back the Water; 37-40, Activity 10, Did You Feel That?; 41-44, Activity 11, Time to Clean Green!

4.E.a. Energy

Students who demonstrate understanding can:

a. Construct a simple explanation for the relationship between energy and motion. [Clarification Statement: Examples could be that a faster ball will make a louder sound when it hits the wall than a slower one or a fast car has more energy than a slow car.] [*Assessment Boundary: No attempt is made to give a precise definition of energy.*]

INTERACTIVE SCIENCE: Chapter 8, Lesson 1 explores the relationship between energy and motion. In the Try It! activity on SE/TE: 350, students **observe** objects in motion and **infer** how energy caused the change. In Energy, SE/TE: 353, #1, students **state** the main idea about energy and its relationship to motion. In #2, they **analyze** the motion and energy in an image. In Energy and Motion on SE/TE: 358, students **obtain information** about the concept of kinetic energy. On TE: 356, Decide, students **obtain information** about the relationship between kinetic energy and sound energy. In Forms of Potential Energy on SE/TE: 358, #7, students **construct the explanation** for kinetic and potential energy by completing the captions. Students **demonstrate** their vocabulary and content knowledge in Lesson Check, TE: 359b, #1-6, and Chapter Review, TE: 386, #1-2. On TE: 385, students **construct** a concept map to show the relationship between energy and motion.

Chapter 9, Lesson 4, explores magnetic energy and motion. In Chapter 10, Lesson 1, students **explain** the relationship between a moving object and one standing still. In the Lightning Lab on SE/TE: 441, students **investigate** the change in position when two objects collide.

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

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 multiple explanations and designing multiple solutions. • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or solution to a problem. **SE/TE:** 350, Try It!, 441, Lightning Lab **TE only:** 354, Science Notebook; 355, Differentiated Instruction	**PS3.A: Definitions of Energy** • The faster a given object is moving, the more energy it possesses. Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (Boundary: At this grade level, no attempt is made to give a precise or complete definition of energy.) **SE/TE:** 350, Try It!; 358, Energy and Motion; 358-359, Forms of Potential Energy; 359, Got it?, #11 **TE Only:** 354, Science Notebook; 355, Differentiated Instruction, 359, Differentiated Instruction, RTI **PS3.B: Conservation of Energy and Energy Transfer** • Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. **PS3.C: Relationship Between Energy and**	**Energy and Matter** Matter is made of particles. Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. Energy can be transferred in various ways and between objects. **SE/TE:** 441, Lightning Lab

	Forces • When objects collide, the contact forces transfer energy so as to change the objects' motions. Magnets can exert forces on other magnets or on magnetizable materials, causing energy transfer between them (e.g., leading to changes in motion) even when the objects are not touching. **SE / TE:** 440, Forces Affect Objects; 441, Force and Motion, Lightning Lab **Related Content TE Only:** 412, Differentiated Instruction **TE Only:** 412, Science to Math; 413, RTI	

4.E.b. Energy

Students who demonstrate understanding can:

b. Carry out investigations to provide evidence that energy is transferred from place to place by sound, light, heat, electric currents, interacting magnets, and moving or colliding objects. [*Assessment Boundary: Quantitative measurements of energy are beyond the scope of assessment.*]

INTERACTIVE SCIENCE: Chapters 8, 9, and 10 explore energy being transferred by sound, light, heat, electric currents, interacting magnets, and moving or colliding objects. In Chapter 8, Lesson 2 students **obtain** information about the transfer of sound energy through matter. In Lightning Lab, SE/TE: 364 students **investigate** sound vibrations related to amount of the air matter and pitch. In Chapter 8, Lesson 3, students **Explore** It! on SE/TE: 366 and At Home Lab, SE/TE: 368, as they **investigate** light energy. In Chapter 8, Lesson 4, students **investigate** the motion of heat energy in Explore It!, SE/TE: 372. On SE/TE: 374, Conduction, students **investigate** heat's motion in the At Home Lab. On SE/TE: 378-379, Investigate It!, students **investigate** the better conductor of heat.

Electricity and magnetism are explored in Chapter 9, Lessons 2 through 5. In the Try It! activity on SE/TE: 392, students **investigate** what types of matter electric currents can move through. In Explore It!, SE/TE: 400, students **investigate** the flow of electrical charges. Students **learn** how electricity transfers energy in Lesson 3. Lesson 4, **covers** electricity and magnets. In Explore It!, SE/TE: 411, students **investigate** the energy of a magnet. Lesson 5 provides magnetism and electricity transformations. On SE/TE: 414, Explore It!, students **make** a motor and **communicate** the transfer of energy.

Moving or colliding objects are covered in Chapter 10, Lesson 1. In the Lightning Lab activity, SE/TE: 441, students **investigate** the transfer of energy when two objects move and collide.

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

Planning and Carrying Out Investigations	**PS3.A: Definitions of Energy**	**Energy and Matter**
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and measurements, collect appropriate data, and identify patterns that provide evidence to explain a phenomenon or test a design solution. **SE/TE:** 350, Try It!; 350, Try It!; 368, At Home Lab; 370, Light and Matter; 372, Explore It!; 374, At-Home Lab; 378-379, Investigate It!; 392, Try It!; 410, Explore It!; 414, Explore It!; 420-421 Investigate It!; 441, Lightning Lab **TE Only:** 371a, Explore It!; 377a, Explore It!; 377b-#1-6, Lesson Check; 379b-379d, Investigate It! Directed Inquiry, Guided Inquiry, Open Inquiry; 418, Differentiated Instruction; 421b-421d, Investigate It! Directed Inquiry, Guided Inquiry, Open Inquiry	• The faster a given object is moving, the more energy it possesses. Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (Boundary: At this grade level, no attempt is made to give a precise or complete definition of energy.) **SE/TE:** 350, Try It!; 353, Energy; 354-355, Forms of Energy; 361, Sound; 362; How Sound Travels; 367, Sources of Light; 372, Explore It!; 373, Conduction; 374, At-Home Lab, A Conduction Example; 375, Convection, Radiation; 392, Try It!; 400, Explore It!; 401, Electric Currents; 408, Light from Electricity; 409, Heat from Electricity; 411, Magnetism; 414, Explore It!; 415, Electric Current and Magnetism; 416, Electromagnets, Explore It!; 418, Transforming Magnetism into Electricity; 419, Challenge, #8, Summarize, #9; 420, Investigate It!; 440, Forces Affect Objects; 441, Force and Motion, Lightning Lab	Matter is made of particles. Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. Energy can be transferred in various ways and between objects. **SE/TE:** 414, Explore It!; 441, Lightning Lab **TE Only:** 377a, Explore It!; 377b-#1-6, Lesson Check

	TE Only: 375, RTI, Science Notebook; 405a, Explore It!; 416, Differentiated Instruction; 418, Differentiated Instruction; 419a, Explore It!; 419b, Lesson Check, #1-6; 421b-421d, Investigate It! Directed Inquiry, Guided Inquiry, Open Inquiry **PS3.B: Conservation of Energy and Energy Transfer** • Light also transfers energy from place to place. For example, energy radiated from the sun is transferred to the earth by light. When this light is absorbed, it warms Earth's land, air, and water and facilitates plant growth. **SE / TE:** 367, Sources of Light, #1, 2	

4.E.c. Energy

Students who demonstrate understanding can:

c. Obtain and communicate information for how technology allows humans to concentrate, transport, and store energy for practical use. [Clarification Statement: Examples could be batteries in electrical devices, power grids, or gasoline stations.]

INTERACTIVE SCIENCE: Chapter 8 explores how technology allows humans to concentrate, transport, and store energy for practical use. In Try It!, SE/TE: 350, students **identify** forms of energy in human items that serve purposes. Students **obtain** information about practical uses of electrical, thermal, and sound energy on SE/TE: 354. On SE/TE: 356-357, students **communicate** the different forms of energy used in the classroom, #6. In TE: 357, Go Green!, students **identify** which technological forms of energy can be controlled to conserve energy. In Changes of Other Energy to Heat, SE/TE: 377, students **predict,** #5, why solar panels are important. In the Field Trip feature on SE/TE: 389, students **obtain information** about the concentration of solar energy in solar cookers. On SE/TE: 431, Go Green!, Unplug It!, students **obtain information** about phantom energy to conserve energy.

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

Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 and progresses to evaluating the merit and accuracy of ideas and methods. • Compare and synthesize across texts and other reliable media to acquire and generate appropriate scientific information. **TE Only:** 376, 21st Century Learning • Generate and communicate scientific and/or technical information orally and/or in written formats using various forms of media and may include tables, diagrams, and charts. **TE Only:** 350, Try It!; 376, 21st Century Learning	**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—for example, the stored energy of water behind a dam is released so that it flows downhill and drives a turbine generator to produce electricity. **SE/TE:** 350, Try It!; 376, Changes of Other Energy to Heat; 389, Field Trip, Solar Cooking **TE Only:** 376, 21st Century Learning • It is important to be able to concentrate energy so that it is available for use where and when it is needed. For example, batteries are physically transportable energy storage devices, whereas electricity generated by power plants is transferred from place to place through distribution systems. **SE/TE:** 354-355; Forms of Energy; 376, Changes of Other Energy to Heat; 389, Field Trip, Solar Cooking; 431, Go Green!, Unplug It! **TE Only:** 357, Go Green!; 376, 21st Century Learning	**Energy and Matter** Matter is made of particles. Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. Energy can be transferred in various ways and between objects.

4.E.d. Energy

Students who demonstrate understanding can:

d. Design and construct a device that converts energy from one form to another using given design criteria.
[Clarification Statement: Examples of devices could be a windmill, watermill, alarm circuit, bell, or solar oven.]

INTERACTIVE SCIENCE: In Chapter 2, Technology and Design, students design and construct items that convert energy from one form to another, using given criteria. In Try It!, SE/TE: 46, students **design** and **construct** a hovercraft. Students **explain** results and **interpret** data, #6, 7. In Explore It!, SE/TE: 54, students **design** a paper plane.

In Chapter 9, students **design** and **construct** devices that convert electrical and magnetic energy. In Try It!, SE/TE: 392, students **construct** an electric circuit that converts chemical to light energy. In the Explore It! activity on SE/TE page 414, students **construct** a motor device that converts magnetic energy to electric energy. In SE/TE: 420-421, Investigate It!, students **construct** an electromagnet to demonstrate conversion of electrical energy to magnetism. In Investigate It!, Directed Inquiry, Guided Inquiry, and Open Inquiry, 421b-421d, students **continue** electromagnet inquiries.

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

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 multiple explanations and designing multiple solutions. • Apply scientific knowledge to solve design problems. (d) **SE/TE:** 46, Try It!; 54, Explore It!; 392, Try It!; 414, Explore It!; 420, Investigate It! **TE Only:** 61a, Explore It!; 405a, Explore It!; 419a, Explore It!	**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—for example, the stored energy of water behind a dam is released so that it flows downhill and drives a turbine generator to produce electricity. **SE/TE:** 392, Try It!; 414, Explore It!; 420, Investigate It! **TE Only:** 376, 21st Century Learning **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. **SE/TE:** 46, Try It!; 54, Explore It!; 376, Changes of Other Energy to Heat; 389, Field Trip, Solar Cooking **TE Only:** 61a, Explore It!	**Connections to Engineering, Technology, and Applications of Science** **Influence of Engineering, Technology, and Science on Society and the Natural World** People's needs and wants change over time, as do their demands for new and improved technologies. Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. When new technologies become available, they can bring about changes in the way people live and interact with one another.

4.E.e. Energy

Students who demonstrate understanding can:

e. Design and test a solution to a problem that utilizes the transfer of electric energy in the solution using given design constraints. [Clarification Statement: Examples of solutions could be a flashlight, electric motor, or doorbell.]

INTERACTIVE SCIENCE: In Chapter 2, Technology and Design, students **design** and **test** items that convert energy from one form to another, using design constraints. In SE/TE: 46, Try It!, students **design** and **test** a hovercraft. In Explore It!, SE/TE: 54, students **design** and test model paper planes. Students **record** data and **explain** the results.

In Chapter 9, students **design** and **test** devices that convert electrical and magnetic energy. In Try It!, SE/TE: 392, students **construct** and **test** an electric circuit that converts chemical to light energy. Students **explain** the results. In TE: 421b, Activity Card, Investigate It!, students **construct** an electromagnet to demonstrate conversion of electrical energy to magnetism and test their predictions.

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

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. • Use simple models to describe phenomena and test cause and effect relationships concerning the functioning of a designed system. **SE/TE:** 46, Try It!; 54, Explore It!; 392, Try It! **TE Only:** 421b, Activity Card, Investigate It!	**PS3.B: Conservation of Energy and Energy Transfer** • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy (e.g., moving water driving a spinning turbine which generates electric currents). **SE/TE:** 392, Try It! **TE Only:** 421b, Activity Card, Investigate It! **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. **SE/TE:** 46, Try It!; 54, Explore It!; 392, Try It! **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. **SE/TE:** 46, Try It!; 54, Explore It!; 392, Try It!	**Connections to Engineering, Technology, and Applications of Science** **Influence of Engineering, Technology, and Science on Society and the Natural World** People's needs and wants change over time, as do their demands for new and improved technologies. Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. When new technologies become available, they can bring about changes in the way people live and interact with one another. **SE/TE:** 46, Try It!

4.E.f. Energy

Students who demonstrate understanding can:

f. Develop a model using examples to explain differences between renewable and non-renewable sources of energy. [*Assessment Boundary: Should not include climate change.*]

INTERACTIVE SCIENCE: This concept is taught in Grade 5: Chapter 8, Lesson 6.

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

Developing and Using Models	**ESS3.A: Natural Resources**	**Energy and Matter**
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. • Construct a model using an analogy, example, or abstract representation to explain a scientific principle or design solution.	• All materials, 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.	Matter is made of particles. Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. Energy can be transferred in various ways and between objects. (a),(b),(c),(f),(g)

4.E.g. Energy

Students who demonstrate understanding can:

g. Construct simple explanations for how forces on an object cause the object to change its energy. [Clarification Statement: Examples of explanations could include how an unbalanced force is required to put an object in motion or stop the motion of an object.]

INTERACTIVE SCIENCE: Chapter 10, Lesson 1, explores how forces on an object cause the object to change its energy. In Forces Affect Objects on SE/TE: 440, students **Explain,** #6, what will happen when two marbles collide. In the **Locate** exercise, #7, students **underline** the five ways a force can affect motion. In the Lightning Lab activity on SE/TE: 441, students **investigate** the transfer of energy when two objects move and collide. In Demonstrate, #8, students **explain** an example of balanced forces. In the Got it? feature on SE/TE: 443, #13, students **describe** how the amount of force needed to change the motion of an object and the mass of an object are related.

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

Planning and Carrying Out Investigations	**PS3.C: Relationship Between Energy and Forces**	**Energy and Matter**
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and measurements, collect appropriate data, and identify patterns that provide evidence to explain a phenomenon or test a design solution. **SE/TE:** 441, Lightning Lab **TE Only:** 441, Science to Writing; 442, Science Notebook	• When objects collide, the contact forces transfer energy so as to change the objects' motions. Magnets can exert forces on other magnets or on magnetizable materials, causing energy transfer between them (e.g., leading to changes in motion) even when the objects are not touching. **SE/TE:** 440, Forces Affect Objects; 441, Force and Motion, Lightning Lab **TE Only:** 441, Science to Writing; 443b, Lesson Check, #1-6	Matter is made of particles. Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. Energy can be transferred in various ways and between objects. **SE/TE:** 440, Forces Affect Objects; 441, Force and Motion, Lightning Lab **TE Only:** 443b, Lesson Check, #6

4.WAV.a. Waves

Students who demonstrate understanding can:

a. Investigate the motions of waves on the surface of water to identify patterns. [*Assessment Boundary: Observations are qualitative, not quantitative.*]

INTERACTIVE SCIENCE: This concept is taught in Pearson *Interactive Science* middle school module, *Water and the Atmosphere*, Chapter 2, Lesson 2.

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

Planning and Carrying Out Investigations	**PS4.A: Wave Properties**	**Patterns**
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. • Discuss and evaluate appropriate methods and tools for collecting data.	• 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—observe, for example, a bobbing cork or seabird—except when the water meets the beach. (Note: This grade band endpoint was moved from K–2).	Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena and designed products. Cyclic patterns of change related to time can be used to make predictions.

4.WAV.b. Waves

Students who demonstrate understanding can:

b. Use a model to describe the amplitude and wavelength of waves.

INTERACTIVE SCIENCE: Chapter 8, Lesson 2 explores the amplitude and wavelength of waves. In Frequency and Wavelength, SE/TE: 363, students **obtain information** from the Wavelength model shown and label the compressions. In Lightning Lab, SE/TE: 364, students **use** a model to demonstrate pitch. Students **label** a wave model, #9, on SE/TE: 365.

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

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. • Use simple models to describe phenomena and test cause and effect relationships concerning the functioning of a natural or designed system. **SE/TE:** 364, Lightning Lab	**PS4.A: Wave Properties** • Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). **SE/TE:** 363, Frequency and Wavelength; 364, Volume; 365, #9-10, 12 **TE Only:** 363, Science Notebook; 365b, Lesson Check, 1-6	**Patterns** Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena and designed products. Cyclic patterns of change related to time can be used to make predictions. **SE/TE:** 363, Frequency and Wavelength; 364, Volume; 365, #9-10 **TE Only:** 365, Differentiated Instruction

4.WAV.c. Waves

Students who demonstrate understanding can:

c. Investigate how waves affect the motions of objects to provide evidence that waves transfer energy to objects as a wave passes. [Clarification Statement: An example of evidence could be corks bobbing up and down as a wave passes.] [*Assessment Boundary: Observations are qualitative not quantitative.*]

INTERACTIVE SCIENCE: This concept is taught in Pearson *Interactive Science* middle school module, *Water and the Atmosphere*, Chapter 2, Lesson 2.

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

Planning and Carrying Out Investigations	**PS4.A: Wave Properties**	**Energy and Matter**
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, collect appropriate data, and identify patterns that provide evidence to explain a phenomenon or test a design solution. • Formulate questions and predict reasonable outcomes based on patterns such as cause and effect relationships.	• 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—observe, for example, a bobbing cork or seabird—except when the water meets the beach. (Note: This grade band endpoint was moved from K–2).	Energy can be transferred in various ways and between objects.

4.WAV.d. Waves

Students who demonstrate understanding can:

d. Investigate the interaction of two waves to describe how waves add or cancel one another depending on their relative phase. [Clarification Statement: Examples of investigations could be two pebbles dropped in water or a slinky shaken at both ends to produce waves that cross.] [*Assessment Boundary: The wave nature of light is not included and observations are qualitative, not quantitative.*]

INTERACTIVE SCIENCE: This concept is taught in Pearson *Interactive Science* middle school module, *Water and the Atmosphere*.

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

Planning and Carrying Out Investigations	**PS4.A: Wave Properties**	**Patterns**
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, collect appropriate data, and identify patterns that provide evidence to explain a phenomenon or test a design solution.	• Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other.	Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena and designed products. Cyclic patterns of change related to time can be used to make predictions.

4.WAV.e. Waves

Students who demonstrate understanding can:

e. Obtain and share information about naturally occurring waves which transfer energy. [Clarification Statement: Naturally occurring waves should include ocean, sound, and seismic waves. Evidence that can be used to show transfer of energy could include coastal erosion or earthquake damage.]

INTERACTIVE SCIENCE: This concept is taught in Pearson *Interactive Science* middle school module, *Water and the Atmosphere*, Chapter 2, Lesson 2.

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

Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 and progresses to evaluating the merit and accuracy of ideas and methods. • Compare and synthesize across texts to acquire and generate appropriate scientific and technical information. • Synthesize information in written text with that contained in corresponding tables, diagrams, and charts. • Critique and communicate scientific and technical information orally and in written formats using various forms of media and may include tables, diagrams, and charts.	**PS4.A: Wave Properties** • Earthquakes cause seismic waves, which are waves of motion in Earth's crust.	**Energy and Matter** Energy can be transferred in various ways and between objects.

4.WAV.f. Waves

Students who demonstrate understanding can:

f. Design, refine, and evaluate a model to solve a problem of transferring information using mechanical waves that can be decoded and communicate the design to others. [Clarification Statement: An example of transferring information could be drums that send information through sound waves.]

INTERACTIVE SCIENCE: This concept is taught in Pearson *Interactive Science* middle school module, *Water and the Atmosphere*, Teacher's Lab Resource, Chapter 2 labs.

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

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. • Construct a model using an analogy, example, or abstract representation to explain a scientific principle or design solution. **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 multiple explanations and designing multiple solutions. • Apply scientific knowledge to solve design problems.	**ETS1.B: Developing Possible Solutions** • There are many types of models, ranging from simple physical models to computer models. They can be used to investigate how a design might work, communicate the design to others, and compare different designs. **ETS2.A: Interdependence of Science, Engineering, and Technology** • Knowledge of relevant scientific concepts and research findings is important in engineering.	**Connections to Engineering, Technology, and Applications of Science** **Interdependence of Science, Engineering, and Technology** Science and technology support each other. That is, tools and instruments are used to answer scientific questions, while scientific discoveries lead to the development of new technologies.

4.WAV.g. Waves

Students who demonstrate understanding can:

g. Obtain and communicate information about modern devices that are used to transmit and receive digital information. [Clarification Statement: An example of a modern device that can be used to transmit and receive digital information could be cell phones.]

Chapter 2, Lesson 1 explores technology as modern devices that transmit and receive information as it improves human life. In My Planet Diary, SE/TE: 48, students **obtain** information about modern devices used to transmit and receive information in today's cars. Students **relate** technology cause and effect and **identify** smart phone capabilities on SE/TE: 49, #2, 3. In Technology and Transportation Systems, students **predict** technology's future uses, SE/TE: 50, #5. On SE/TE: 51 students **apply** what they know about a GPS device and **write** about a problem that they think a GPS could solve. On SE/TE: 53 students **infer** how they think an electronic whiteboard in their classroom may work. In the Got it? feature on SE/TE: 53, Unlock the Big Question, students **identify** a technology they use everyday and how it affects their life. In Go Green!, Green Transportation, SE/TE: 71, students **obtain** and **communicate** information about technology's use in hybrid cars and catalytic converters. In SE: 78 / TPG: 46, Performance-Based Assessment, students **communicate** information in a report about how transportation has changed society.

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

Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 and progresses to evaluating the merit and accuracy of ideas and methods. • Compare and synthesize across texts to acquire and generate appropriate scientific and technical information. **SE/TE:** 51, Technology; 52-53, Everyday Technologies **TE Only:** 50, 21st Century Learning; 53, Differentiated Instruction **TPG:** 46, Performance-Based Assessment, Write a Report Critique and communicate scientific and technical information orally and in written formats using various forms of media and may include tables, diagrams, and charts. **SE/TE:** 49, Cause and Effect, #2 **TE Only:** 53, Differentiated Instruction	**PS4.C: Information Technologies and Instrumentation** • Digitized information (e.g., the pixels of a picture) can be stored for future recovery or 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. **SE/TE:** 48, My Planet Diary; 49, Scientific Discoveries, #2, 3; 50-51, Technology and Transportation Systems, #6; 52-53, Everyday Technologies; 53-#10, Got it?	**Connections to Engineering, Technology, and Applications of Science** **Interdependence of Science, Engineering, and Technology** Science and technology support each other. That is, tools and instruments are used to answer scientific questions, while scientific discoveries lead to the development of new technologies. **SE/TE:** 48, My Planet Diary; Scientific Discoveries, #1, 2; 71, Go Green!, Green Transportation **TE only:** 50, Science Notebook; 53a, My Planet Diary; 53b, Lesson Check, #1-6 **TPG:** 46, Performance-Based Assessment, Write a Report