GRADE 6

Matter and Its Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-PS1-4

Students who demonstrate understanding can:
Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

***Clarification Statement**: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.*
***Assessment Boundary**: The use of mathematical formulas is not required.*

Weather and Water
TE: Investigation 3, Part 2: performance assessment
Investigation 3, Part 3: notebook entry; Investigation 3 I-Check
Investigation 6, Part 1: notebook entry
Investigation 6, Part 2: notebook entry
Investigation 6, Part 3: notebook entry; Investigation 6, I-Check
Investigation 7, Part 2: response sheet
Investigation 7, Part 3: notebook entry; Investigation 7-8, I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop a model to predict and/or describe phenomena.

Weather and Water
TE: investigation 3, Part 2, pp. 268-283
SE: *Density,* pp. 41-46; *Density with Dey,* pp. 47-50
DR: "Particles in Solids, Liquids, and Gases" (Online Activity), Fluid Convection (Video)

Investigation 3, Part 3, pp. 288-295
SE: *Convection,* pp. 51-52
DR: "Energy Transfer: Conduction, Radiation, Convection" (Online Activity)
Convection Chamber in Action (Video)

Investigation 6, Part 1, pp. 436-448
SE: *Heating the Atmosphere,* pp. 69-75

Investigation 6, Part 2, pp. 451-456
DR: "Local Wind" (Online Activity)

Investigation 6, Part 3, pp.462-481

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter
Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.

In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.

The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.

PS1.A Definitions of Energy
The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects.

The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material.

Crosscutting Concepts

Cause and Effect
Cause and Effect relationships may be used to predict phenomena in natural or designed systems.

Weather and Water
TE: investigation 3, Part 2, pp. 268-283
SE: *Density,* pp. 41-46; *Density with Dey,* pp. 47-50
DR: "Particles in Solids, Liquids, and Gases" (Online Activity), Fluid Convection (Video)

Investigation 3, Part 3, pp. 288-295
SE: *Convection,* pp. 51-52
DR: "Energy Transfer: Conduction, Radiation, Convection" (Online Activity) Convection Chamber in Action (Video)

Investigation 6, Part 1, pp. 436-448
SE: *Heating the Atmosphere,* pp. 69-75

Investigation 6, Part 2, pp. 451-456
DR: "Local Wind" (Online Activity)

Investigation 6, Part 3, pp.462-481
SE: *Wind on Earth,* pp. 76-84
DR: NOAA Ridge (Video)

Investigation 7, Part 2, pp. 509-515

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

SE: *Wind on Earth,* pp. 76-84
DR: NOAA Ridge (Video)

Investigation 7, Part 2, pp. 509-515

Investigation 7, Part 3, pp. 520-529
DR: Cloud in a Bottle (Video)

Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.

Weather and Water
TE: investigation 3, Part 2, pp. 268-283
SE: *Density,* pp. 41-46; *Density with Dey,* **pp.** *47-50*
DR: "Particles in Solids, Liquids, and Gases" (Online Activity), Fluid Convection (Video)

Investigation 3, Part 3, pp. 288-295
SE: *Convection,* pp. 51-52
DR: "Energy Transfer: Conduction, Radiation, Convection" (Online Activity), Convection Chamber in Action (Video)

Investigation 6, Part 1, pp. 436-448
SE: *Heating the Atmosphere,* pp. 69-75

Investigation 6, Part 2, pp. 451-456
DR: "Local Wind" (Online Activity)

Investigation 6, Part 3, pp.462-481
SE: *Wind on Earth,* pp. 76-84
DR: NOAA Ridge (Video)

Investigation 7, Part 2, pp. 509-515

Investigation 7, Part 3, pp. 520-529
DR: Cloud in a Bottle (Video)

Investigation 7, Part 3, pp. 520-529
DR: Cloud in a Bottle (Video)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Scale, Proportion, and Quantity
Patterns
Systems and System Models
Energy and Matter
Stability and Change
Structure and Function

GRADE 6

Energy

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-PS3-3

Students who demonstrate understanding can:
Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

***Clarification Statement**: Examples of devices could include an insulated box, a solar cooker, and a polystyrene foam cup.*
***Assessment Boundary**: Assessment does not include calculating the total amount of thermal energy transferred.*

Weather and Water
TE: Investigation 5, Part 2: response sheet
Investigation 5, Part 3: performance assessment
Investigations 5-6 I-Check

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progressed to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process, or system.

Weather and Water
TE: Investigation 5, Part 2, pp. 392-399
DR: "Particles in Solids, Liquids, and Gases" (Online Activity)

Investigation 5, Part 3, pp. 403-419
SE: *Home Insulation,* pp. 64-68

Disciplinary Core Ideas

PS3.A: Definitions of Energy
The term "heat" as used in everyday language refers to both thermal energy (the motion of atoms or molecules within a substance) and energy transfers by convection, conduction, and radiation (particularly infrared and light).

PS3.B: Conservation of Energy and Energy Transfer

The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.

Energy is spontaneously transferred out of hotter regions or objects and into colder ones by the processes of conduction, convection, and radiation.

ETS1.A: Defining and Delimiting an Engineering Problem
The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful.

Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions.

ETS1.B: Developing Possible Solutions
A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.

Weather and Water
TE: Investigation 5, Part 1, pp. 378-387

Crosscutting Concepts

Energy and Matter
The transfer of energy can be tracked as energy flows through a designed or natural system.

Weather and Water
TE: Investigation 5, Part 1, pp. 378-387
DR: Conduction through Metals (Video), "Energy Transfer by Collision" (Online Activity), "Energy Transfer: Conduction, Radiation, Convection" (Online Activity) "Particles in Solids, Liquids, and Gases" (Online Activity), "Thermometer" (Online Activity)

Investigation 5, Part 2, pp. 392-399
DR: "Particles in Solids, Liquids, and Gases" (Online Activity)

Investigation 5, Part 3, pp. 403-419
SE: *Home Insulation,* pp. 64-68

	DR: Conduction through Metals (Video), "Energy Transfer by Collision" (Online Activity), "Energy Transfer: Conduction, Radiation, Convection" (Online Activity), "Particles in Solids, Liquids, and Gases" (Online Activity), "Thermometer" (Online Activity) Investigation 5, Part 2, pp. 392-399 **DR**: "Particles in Solids, Liquids, and Gases" (Online Activity) Investigation 5, Part 3, pp. 403-419 SE: *Home Insulation,* pp. 64-68	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Energy and Matter
Systems and System Models
Structure and Function

GRADE 6

Energy

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-PS3-4

Students who demonstrate understanding can:
Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

***Clarification Statement**: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.*
***Assessment Boundary**: Assessment does not include calculating the total amount of thermal energy transferred.*

Weather and Water
TE: Investigation 3, Part 2: performance assessment
Investigation 3, Part 3: notebook entry; Investigation 3 I-Check
Investigation 4, Part 3: performance assessment
Investigation 5, Part 1: notebook entry
Investigation 5, Part 2: response sheet
Investigation 5, Part 3: performance assessment

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying investigations to answer questions or test solutions to problems in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.

Weather and Water
TE: Investigation 4, Part 3, pp. 346-358
SE: *Thermometer: A Device to Measure Temperature,* pp. 59-63
DR: Energy Transfer: Conduction, Radiation, Convection" (Online Activity)

Investigation 5, Part 1, pp. 378-387
DR: "Energy Transfer by Collision" (Online Activity), "Energy Transfer: Conduction, Radiation, Convection" (Online Activity), "Particles in Solids, Liquids, and Gases" (Online Activity), "Thermometer" (Online Activity)
Conduction Through Metals (Video)

Investigation 5, Part 2, pp. 392-399

Disciplinary Core Ideas

PS3.A: Definitions of Energy
Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.

PS3.B: Conservation of Energy and Energy Transfer

The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.

Weather and Water
TE: investigation 3, Part 2, pp. 268-283
SE: *Density,* pp. 41-46; *Density with Dey,* pp. 47-50
DR: "Particles in Solids, Liquids, and Gases" (Online Activity), Fluid Convection (Video)

Investigation 3, Part 3, pp. 288-295
SE: *Convection,* pp. 51-52
DR: "Energy Transfer: Conduction, Radiation, Convection" (Online Activity)
Convection Chamber in Action (Video)

Investigation 4, Part 3, pp. 346-358
SE: *Thermometer: A Device to Measure*

Crosscutting Concepts

Scale, Proportion, and Quantity
Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.

Weather and Water
TE: Investigation 3, Part 3, pp. 288-295
SE: *Convection,* pp. 51-52
DR: "Energy Transfer: Conduction, Radiation, Convection" (Online Activity)
Convection Chamber in Action (Video)

Investigation 4, Part 3, pp. 346-358
SE: *Thermometer: A Device to Measure Temperature,* pp. 59-63
DR: Energy Transfer: Conduction, Radiation, Convection" (Online Activity)

DR: "Particles in Solids, Liquids, and Gases" (Online Activity) Investigation 5, Part 3, pp. 403-419 SE: *Home Insulation,* pp. 64-68	*Temperature,* pp. 59-63 **DR:** "Energy Transfer: Conduction, Radiation, Convection" (Online Activity) Investigation 5, Part 1, pp. 378-387 **DR:** "Energy Transfer by Collision" (Online Activity), "Energy Transfer: Conduction, Radiation, Convection" (Online Activity), "Particles in Solids, Liquids, and Gases" (Online Activity), "Thermometer" (Online Activity) Conduction Through Metals (Video) Investigation 5, Part 2, pp. 392-399 **DR**: "Particles in Solids, Liquids, and Gases" (Online Activity) Investigation 5, Part 3, pp. 403-419 SE: *Home Insulation,* pp. 64-68	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Cause and Effect
Energy and Matter
Systems and System Models
Structure and Function
Stability and Change

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GRADE 6

Waves and Their Applications in Technologies for Information Transfer

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-PS4-2

Students who demonstrate understanding can:
Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

***Clarification Statement**: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.*
***Assessment Boundary**: Assessment is limited to qualitative applications pertaining to light and mechanical waves.*

Wave Models
TE: Investigation Part 1 – Science notebook entry
TE: Investigation Part 2 – Performance assessment

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe phenomena.

Wave Models
Part 1 notebook entry: Mechanical Wave Model

Part 2 notebook entry: Electromagnetic Wave Model

Disciplinary Core Ideas

PS4.A: Wave Properties
A sound wave needs a medium through which it is transmitted.

Wave Models
TE: Part 1, Steps 1-17
SE: "*Sound Waves*"
Videos: Compression Waves, Transverse Waves

PS4.B: Electromagnetic Radiation
When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light.

The path that light travels can be traced as straight lines, except at surfaces between different transparent materials 9e.g., air and water, air and glass) where the light path bends.

A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media.

However, because light can travel through space, it cannot be a matter wave, like sound or water waves.

Wave Models
TE: Part 2, Steps 1-18
SE: "*Seismic Waves*"
"Reflecting on Light"
"Throw a Little Light on Sight"
"Electromagnetic Spectra"
Online Activity: Refraction

Crosscutting Concepts

Structure and Function
Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

Wave Models
SE: "Acoustic Engineering"
"*Seismic Waves*"

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Cause and Effect
Energy and Matter
Systems and System Models
Stability and Change

GRADE 6

From Molecules to Organisms: Structures and Processes

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-LS1-1

Students who demonstrate understanding can:

Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

***Clarification Statement**: Emphasis is on developing evidence that living things are made of at least one cell, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.*

***Assessment Boundary**: Assessment does not include identification of specific cell types and should emphasize the use of evidence from investigations.*

Diversity of Life

TE: Investigation 3, Part 1: notebook entry
Investigation 3, Part 2: response sheet
Investigation 3, Part 3: performance assessment
Investigation 3, Part 4: notebook entry; Investigation 3 I-Check
Investigation 4, Part 1: notebook entry, response sheet
Investigation 4, Part 2: quick write
Investigation 4, Part 3: notebook entry
Investigation 4, Part 4: notebook entry; Investigation 4 I-Check
Investigation 5, Part 3: notebook entry
Investigation 9, Part 2: notebook entry

Human Systems Interactions

TE: Investigation 1, Part 1: notebook entry

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying out investigations in 6-8 builds on K-5 experience es and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.

Diversity of Life
TE: Investigation 3, Part 1, pp.228-235
DR: Lab Techniques: Making a Wet- Mount (Video)
"Virtual Microscope" (Online Resource)
"Database: Elodea Cells" (Online Resource), "Database: Elodea Cytoplasmic Streaming" (Online Resource), "Levels of Complexity: Plant Cell" (Online Activity)

Investigation 3, Part 2, pp. 240-250
SE: The Amazing Paramecium, pp. 14-19

Disciplinary Core Ideas

LS1.A: Structure and Function
All living things are made up of cells, which is the smallest unit that can be said to be alive.
An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).

EST2.A: Interdependence of Science, Engineering, and Technology

Diversity of Life
TE: Investigation 3, Part 1, pp.228-235
DR: Lab Techniques: Making a Wet- Mount (Video)
"Virtual Microscope" (Online Resource)
"Database: Elodea Cells" (Online Resource), "Database: Elodea Cytoplasmic Streaming" (Online Resource), "Levels of Complexity: Plant Cell" (Online Activity)

Investigation 3, Part 2, pp. 240-250
SE: The Amazing Paramecium, pp. 14-19

Crosscutting Concepts

Scale, Proportion, and Quantity
Phenomena that can be observed at one scale may not be observable at another scale.

Diversity of Life
TE: Investigation 3, Part 1, pp.228-235
DR: Lab Techniques: Making a Wet- Mount (Video)
"Virtual Microscope" (Online Resource)
"Database: Elodea Cells" (Online Resource), "Database: Elodea Cytoplasmic Streaming" (Online Resource), "Levels of Complexity: Plant Cell" (Online Activity)

Investigation 3, Part 2, pp. 240-250
SE: The Amazing Paramecium, pp. 14-19
DR: Lab Techniques: Preparing a Paramecia Wet-Mount Slide (Video), "Levels of Complexity: Protist Cell" (Online Activity), "Database: Paramecium Collection (Online Resource)

DR: Lab Techniques: Preparing a Paramecia Wet-Mount Slide (Video), "Levels of Complexity: Protist Cell" (Online Activity), "Database: Paramecium Collection (Online Resource)

Investigation 3, Part 3, pp. 254-258
SE: Microorganism Guide, pp. 106-109
DR: "Database: Microorganism Collection" Online Resource)

Investigation 3, Part 4, pp. 263-279
SE: *Cells,* pp. 20-27; *How Big are Cells?* pp. 110-113
DR: Lab Techniques: Making a Human-Cheek-Tissue Slide (Video) "Database: Human Cheek Cells" (Online Resource); "Levels of Complexity: Animal Cell" (Online Activity)

Investigation 4, Part 1, pp. 306-318
SE: *Levels of Complexity Research Pages,* pp. 114-120
DR: Lab Techniques: Inoculating an Agar Plate (Video); "The Scale of the Universe" (Online Activity), "Levels of Complexity Card Sort" (Online Activity)

Investigation 4, Part 2, pp. 326-347
SE: *Bacteria Around Us,* pp. 28-35, *Harmful and Helpful Bacteria,* pp. 36-43
Investigation 4, Part 3, pp. 352-361
DR: "Levels of Complexity: Fungal Cell: (Online Activity), "Funk Fungi Freak Show" (Online Activity); "Fungus" (online slide show)

Investigation 4, Part 4, pp. 365-373
DR: "Levels of Complexity: Archaean Cell" (Online Activity); "Classification History" (online slide show)

DR: Lab Techniques: Preparing a Paramecia Wet-Mount Slide (Video), "Levels of Complexity: Protist Cell" (Online Activity), "Database: Paramecium Collection (Online Resource)

Investigation 3, Part 3, pp. 254-258
SE: Microorganism Guide, pp. 106-109
DR: "Database: Microorganism Collection" (Online Resource)

Investigation 3, Part 4, pp. 263-279
SE: *Cells,* pp. 20-27; *How Big are Cells?* pp. 110-113
DR: Lab Techniques: Making a Human-Cheek-Tissue Slide (Video) "Database: Human Cheek Cells" (Online Resource); "Levels of Complexity: Animal Cell" (Online Activity)

Investigation 4, Part 1, pp. 306-318
SE: *Levels of Complexity Research Pages,* pp. 114-120
DR: Lab Techniques: Inoculating an Agar Plate (Video); "The Scale of the Universe" (Online Activity), "Levels Of Complexity Card Sort" (Online Activity)

Investigation 4, Part 2, pp. 326-347
SE: *Bacteria Around Us,* pp. 28-35, *Harmful and Helpful Bacteria,* pp. 36-43
Investigation 4, Part 3, pp. 352-361
DR: "Levels of Complexity: Fungal Cell: (Online Activity), "Funk Fungi Freak Show" (Online Activity); "Fungus" (online slide show)

Investigation 4, Part 4, pp. 365-373
DR: "Levels of Complexity: Archaean Cell" (Online Activity); "Classification History" (online slide show)

Investigation 5, Part 3, pp. 417-432
SE: *Water, Light, and Energy,* pp. 50-57
DR: "Plant Vascular System" (Online Activity)

Investigation 9, Part 2, pp. 628-639
SE: *Viruses: Living or Nonliving?* Pp. 95-100
DR: Flu Attack! (Video), Viruses on the Attack (Video)

Human Systems Interactions
TE: Investigation 1, Part 1, pp. 87-94
DR: Doctor Interview 1 (Video); "Levels of Complexity" (Online Activity)

Investigation 3, Part 3, pp. 254-258
SE: Microorganism Guide, pp. 106-109
DR: "Database: Microorganism Collection" (Online Resource)

Investigation 3, Part 4, pp. 263-279
SE: *Cells,* pp. 20-27; *How Big are Cells?* pp. 110-113
DR: Lab Techniques: Making a Human-Cheek-Tissue Slide (Video) "Database: Human Cheek Cells" (Online Resource); "Levels of Complexity: Animal Cell" (Online Activity)

Investigation 4, Part 1, pp. 306-318
SE: *Levels of Complexity Research Pages,* pp. 114-120
DR: Lab Techniques: Inoculating an Agar Plate (Video); "The Scale of the Universe" (Online Activity), "Levels Of Complexity Card Sort" (Online Activity)

Investigation 4, Part 2, pp. 326-347
SE: *Bacteria Around Us,* pp. 28-35, *Harmful and Helpful Bacteria,* pp. 36-43

Investigation 4, Part 4, pp. 365-373
DR: "Levels of Complexity: Archaean Cell" (Online Activity); "Classification History" (online slide show)

Human Systems Interactions
TE: Investigation 1, Part 1, pp. 87-94
DR: Doctor Interview 1 (Video); "Levels of Complexity" (Online Activity)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Cause and Effect
Systems and System Models
Structure and Function

GRADE 6

From Molecules to Organisms: Structure and Processes

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-LS1-2

Students who demonstrate understanding can:
Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

***Clarification Statement**: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall*
***Assessment Boundary**: Assessment of organelle structure/function relationships limited to cell wall and cell membrane. Assessment of other organelles is limited to their relationship to the whole cell. Assessment does not include biochemical functions of cell or cell parts.*

Diversity of Life
TE: Investigation 3, Part 1: performance assessment
Investigation 3, Part 2: response sheet
Investigation 3, Part 4: notebook entry; Investigation 3 I-Check
Investigation 4, Part 2: quick write
Investigation 4, Part 3: notebook entry
Investigation 4, Part 4: notebook entry; Investigation 4 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe phenomena.

Diversity of Life
TE: Investigation 3, Part 1, pp. 228-235
DR: "Database: Elodea Cells" (Online resource), Database: Elodea Cytoplasmic Streaming" (Online resource), "Levels of Complexity: Plant Cell" (Online Activity)

Investigation 3, Part 2, pp. 240-250
SE: *The Amazing Paramecium,* pp. 14-19
DR: "Levels of Complexity: Protist Cell" (Online Activity), "Database: Paramecium Collection" (Online resource)

Investigation 3, Part 4, pp. 263-279
SE: *The Cell,* pp. 20-27
DR: "Database: Human Cheek Cells" (Online Resource), "Levels of Complexity: Animal Cell" (Online Activity)

Investigation 4, Part 2, pp. 326-347
SE: *Bacteria Around Us,* pp. 28-35,

Disciplinary Core Ideas

LS1.A: Structure and Function
Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.

Diversity of Life
TE: Investigation 3, Part 1, pp. 228-235
DR: "Database: Elodea Cells" (Online resource), Database: Elodea Cytoplasmic Streaming" (Online resource), "Levels of Complexity: Plant Cell" (Online Activity)

Investigation 3, Part 2, pp. 240-250
SE: *The Amazing Paramecium,* pp. 14-19
DR: "Levels of Complexity: Protist Cell" (Online Activity), "Database: Paramecium Collection" (Online resource)

Investigation 3, Part 4, pp. 263-279
SE: *The Cell,* pp. 20-27
DR: "Database: Human Cheek Cells" (Online Resource), "Levels of Complexity: Animal Cell" (Online Activity)

Investigation 4, Part 2, pp. 326-347
SE: *Bacteria Around Us,* pp. 28-35, *Harmful and Helpful Bacteria,* pp. 36- 43

Crosscutting Concepts

Structure and Function
Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural systems can be analyzed to determine how they function.

Diversity of Life
TE: Investigation 3, Part 1, pp. 228-235
DR: "Database: Elodea Cells" (Online resource), Database: Elodea Cytoplasmic Streaming" (Online resource), "Levels of Complexity: Plant Cell" (Online Activity)

Investigation 3, Part 2, pp. 240-250
SE: *The Amazing Paramecium,* pp. 14-19
DR: "Levels of Complexity: Protist Cell" (Online Activity), "Database: Paramecium Collection" (Online resource)

Investigation 3, Part 4, pp. 263-279
SE: *The Cell,* pp. 20-27
DR: "Database: Human Cheek Cells" (Online Resource), "Levels of Complexity: Animal Cell" (Online Activity)

Investigation 4, Part 2, pp. 326-347
SE: *Bacteria Around Us,* pp. 28-35, *Harmful and Helpful Bacteria,* pp. 36-

Harmful and Helpful Bacteria, pp. 36-43 Investigation 4, Part 3, pp. 352-361 **DR:** "Levels of Complexity: Fungal Cell: (Online Activity), "Funk Fungi Freak Show" (Online Activity); "Fungus" (online slide show) Investigation 4, Part 4, pp. 365-373 **DR:** "Levels of Complexity: Archaean Cell" (Online Activity); "Classification History" (online slide show)	Investigation 4, Part 3, pp. 352-361 **DR:** "Levels of Complexity: Fungal Cell: (Online Activity), "Funk Fungi Freak Show" (Online Activity); "Fungus" (online slide show) Investigation 4, Part 4, pp. 365-373 **DR:** "Levels of Complexity: Archaean Cell" (Online Activity); "Classification History" (online slide show)	43 Investigation 4, Part 3, pp. 352-361 **DR:** "Levels of Complexity: Fungal Cell: (Online Activity), "Funk Fungi Freak Show" (Online Activity); "Fungus" (online slide show) Investigation 4, Part 4, pp. 365-373 **DR:** "Levels of Complexity: Archaean Cell" (Online Activity); "Classification History" (online slide show)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Asking Questions and Defining Problems
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Systems and System Models
Scale, Proportion, and Quantity

GRADE 6

From Molecules to Organisms: Structure and Processes

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-LS1-3

Students who demonstrate understanding can:
Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Clarification Statement: *Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.*
Assessment Boundary*: Assessment does not include the mechanism of one body system independent of other or individual organs and structures. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, skeletal, and nervous systems and is limited to the interdependence of body systems.*

Human Systems Interactions
TE: Investigation 1, Part 1: notebook entry
Investigation 1, Part 2: performance assessment
Investigations 1-2 I-Check

Science and Engineering Practices

Engaging in Argument from Evidence
Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.

Human Systems Interactions
TE: Investigation 1, Part 1, pp. 87-94
DR: Doctor Interview 1 (Video), "Levels of Complexity" (Online Activity), "Structural Levels Cards" (Online Activity)

Investigation 1, Part 2, pp. 99-112
SE: *Human Organ Systems,* pp. 3-49; *Disease Information,* pp. 98-103 *Diabetes Affects Human Organ Systems,* p. 97
DR: Doctor Interview 2 (Video); "Structural Level Cards" (Online Activity); "Climate Change Indicators in the United States" (Online Activity)

Disciplinary Core Ideas

LS1.A: Structure and Function
In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.

Human Systems Interactions
TE: Investigation 1, Part 1, pp. 87-94
DR: Doctor Interview 1 (Video), "Levels of Complexity" (Online Activity), "Structural Levels Cards" (Online Activity)

Investigation 1, Part 2, pp. 99-112
SE: *Human Organ Systems,* pp. 3-49; *Disease Information,* pp. 98-103 *Diabetes Affects Human Organ Systems,* p. 97
DR: Doctor Interview 2 (Video); "Structural Level Cards" (Online Activity); "Climate Change Indicators in the United States" (Online Activity)

Crosscutting Concepts

Systems and System Models
Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.

Human Systems Interactions
TE: Investigation 1, Part 1, pp. 87-94
DR: Doctor Interview 1 (Video), "Levels of Complexity" (Online Activity), "Structural Levels Cards" (Online Activity)

Investigation 1, Part 2, pp. 99-112
SE: *Human Organ Systems,* pp. 3-49; *Disease Information,* pp. 98-103 *Diabetes Affects Human Organ Systems,* p. 97
DR: Doctor Interview 2 (Video); "Structural Level Cards" (Online Activity); "Climate Change Indicators in the United States" (Online Activity)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Cause and Effect
Scale, Proportion, and Quantity
Structure and Function

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

GRADE 6

From Molecules to Organisms: Structure and Processes

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-LS1-8

Students who demonstrate understanding can:
Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Clarification Statement: *Examples of stimulus and sensory receptor pairings include electromagnetic stimuli (light intensity and color) are received: by the eye; mechanical stimuli (sound waves) are received by the hair cells of the inner ear; mechanical stimuli (pressure) are received by the skin; and chemical stimuli (foods) are received by the various taste buds.*
Assessment Boundary*: Assessment does not include identifying specific structures of the brain or mechanisms for the transmission of this information.*

Human Systems Interactions
TE: Investigation 3, Parts 1 and 3: notebook entry
Investigation 3, Part 2: response sheet
Investigation 3, Part 4: notebook entry; Investigation 3 I-Check

Science and Engineering Practices

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 6-8 builds upon K-5 experiences and progresses to evaluating the merit and validity of ideas and methods.

Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.

Human Systems Interactions
TE: Investigation 3, Part 1, pp. 173-189
SE: *Sensory Receptors,* pp. 55-59; *Touch,* pp. 60-63 *Hearing,* pp. 64-68
DR: "Touch Menu: Touch Receptors", (Online Activity); " Touch Menu: 3D Finger" (Online Activity)

Investigation 3, Part 2, pp. 193-212
SE: *Brain Messages,* pp. 79-83 ; *Neurotransmission,* pp. 84-87
DR: "Brain: Synapse Function" (Online Activity), "Brain: Neuron Growth" (Online Activity)

Investigation 3, Part 3, pp. 216-229
SE: *Sensory Receptors,* pp. 55-59; *Smell and Taste,* pp. 69-73 ; *Sight,* pp. 74-78
DR: "Smell Menu" (Online Activity), "Vision Menu" (Online Activity),

Disciplinary Core Ideas

LS1.D: Information Processing
Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.

Changes in the structure and functioning of many millions of interconnected nerve cells allow combined inputs to be stored as memories for long periods of time.

Human Systems Interactions
TE: Investigation 3, Part 1, pp. 173-189
SE: *Sensory Receptors,* pp. 55-59, *Touch,* pp. 60-63 *Hearing,* pp. 64-68
DR: "Touch Menu: Touch Receptors", (Online Activity); " Touch Menu: 3D Finger" (Online Activity)

Investigation 3, Part 2, pp. 193-212
SE: *Brain Messages,* pp. 79-83 ; *Neurotransmission,* pp. 84-87
DR: "Brain: Synapse Function" (Online Activity), "Brain: Neuron Growth" (Online Activity)

Investigation 3, Part 3, pp. 216-229

SE: *Sensory Receptors,* pp. 69-73; *Smell And Taste,* pp. 69-73 ; *Sight,* pp. 74-78
DR: "Smell Menu" (Online Activity), "Vision Menu" (Online Activity),

Crosscutting Concepts

Cause and Effect
Cause and effect relationships may be used to predict phenomena in natural systems

Human Systems Interactions
TE: Investigation 3, Part 2, pp. 193-212
SE: *Brain Messages,* pp. 79-83 ; *Neurotransmission,* pp. 84-87
DR: "Brain: Synapse Function" (Online Activity), "Brain: Neuron Growth" (Online Activity

"Reaction Timer" (Online Activity) Investigation 3, Part 4, pp. 235-249 **SE:** *Memory and Your Brain,* pp. 88-92 **DR:** How Memory Works (Video)	"Reaction Timer" (Online Activity) Investigation 3, Part 4, pp. 235-249 **SE:** *Memory and Your Brain,* pp. 88-92 **DR:** How Memory Works (Video)	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 6

Earth's Place in the Universe

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-ESS1-4

Students who demonstrate understanding can:
Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

***Clarification Statement**: Emphasis is on analyses of rock formations and fossils they contain to establish relative ages of major events in Earth's history. Scientific explanations can include models to study the geologic time scale.*
***Assessment Boundary**: Assessment does not include recalling the names of specific periods or epochs and events within them.*

Earth History
TE: Investigation 3, Part 3: notebook entry
Investigation 4, Part 1: response sheet
Investigation 4, Part 2: notebook entry
Investigation 4, Part 3: performance assessment, notebook entry, Investigation 4 I-Check

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past, and will continue to do so in the future.

Earth History
TE: Investigation 3 Part 3, pp. 294-302
SE: *Water on Mars?* pp. 40-44
DR: "Rock Column Movie Maker" (Online Activity) "Sedimentary Rocks Tour" (Online Activity), "Rock Data Base" (Online Activity)

Investigation 4, Part 1, pp. 328-345
SE: *Grand Canyon Fossils,* pp. 173-174, *Fossil Identification,* pp. 167-172, *Modern Sedimentary Environments,* pp. 164-165, *A Fossil Primer,* pp. 45-49
Features of Sedimentary Rocks, p. 166
DR: "Limestone Formation" (Online Activity), "Sandstone Formation" (Online Activity), "Shale Formation" (Online Activity), "Rock Column Movie Maker" (Online Activity)

Investigation 4, Part 2, pp. 351-359

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth
The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.

Major historical events include the formation of mountain chains and ocean basins, the adaptation and extinction of particular living organisms, volcanic eruptions, periods of massive glaciation, and development of watersheds and rivers through glaciation and water erosion.

Earth History
TE: Investigation 3 Part 3, pp. 294-302
SE: *Water on Mars?* pp. 40-44
DR: "Rock Column Movie Maker" (Online Activity) "Sedimentary Rocks Tour" (Online Activity), "Rock Data Base" (Online Activity)

Investigation 4, Part 1, pp. 328-345
SE: *Grand Canyon Fossils,* pp. 173-174, *Fossil Identification,* pp. 167-172, *Modern Sedimentary Environments,* pp. 164-165, *A Fossil Primer,* pp. 45-49
Features of Sedimentary Rocks, p. 166
DR: "Limestone Formation" (Online Activity), "Sandstone Formation" (Online Activity), "Shale Formation" (Online Activity), "Rock Column Movie Maker" (Online Activity)

Crosscutting Concepts

Scale, Proportion, and Quantity
Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Earth History
TE: Investigation 3 Part 3, pp. 294-302
SE: *Water on Mars?* pp. 40-44
DR: "Rock Column Movie Maker" (Online Activity) "Sedimentary Rocks Tour" (Online Activity), "Rock Data Base" (Online Activity)

Investigation 4, Part 2, pp. 351-359
SE: *The Geologic Time Scale,* p. 175, *Fossil Identification,* pp. 167-172
DR: "Timeliner" (Online Activity)

Investigation 4, Part 3, pp. 364-392
SE: *Rocks, Fossils, and Time,* pp. 50-63, *Grand Canyon Views,* pp. 138-141, *The Great Unconformity,* pp. 178
Floating on a Prehistoric Sea, pp. 64-67
DR: "Dating Rock Layers" (Online Activity), "Index-Fossil Correlation" (Online Activity)

SE: *The Geologic Time Scale,* p. 175, *Fossil Identification,* pp. 167-172 **DR:** "Timeliner" (Online Activity) Investigation 4, Part 3, pp. 364-392 **SE:** *Rocks, Fossils, and Time,* pp. 50-63, *Grand Canyon Views,* pp. 138-141, *The Great Unconformity,* pp. 178 *Floating on a Prehistoric Sea,* pp. 64-67 **DR:** "Dating Rock Layers" (Online Activity), "Index-Fossil Correlation" (Online Activity)	Investigation 4, Part 2, pp. 351-359 **SE:** *The Geologic Time Scale,* p. 175, *Fossil Identification,* pp. 167-172 **DR:** "Timeliner" (Online Activity) Investigation 4, Part 3, pp. 364-392 **SE:** *Rocks, Fossils, and Time,* pp. 50-63, *Grand Canyon Views,* pp. 138-141, *The Great Unconformity,* pp. 178 *Floating on a Prehistoric Sea,* pp. 64-67 **DR:** "Dating Rock Layers" (Online Activity), "Index-Fossil Correlation" (Online Activity)	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Stability and Change
Cause and Effect
Systems and System Models
Structure and Function

GRADE 6

Earth's Place in the Universe

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-ESS2-1

Students who demonstrate understanding can:
Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

***Clarification Statement**: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form and change minerals and rocks through the cycling of Earth's materials.*
***Assessment Boundary**: Assessment does not include the identification and naming of minerals.*

Earth History
TE: Investigation 7, Part 1: notebook entry
Investigation 7, Part 2, notebook entry, performance assessment, Investigation 7 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe phenomena.

Earth History
TE: Investigation 7, Part 1, 546-567
SE: *Earth's Dynamic Systems,* pp. 81-87
DR: "Convergent Boundary,"
"Divergent Boundary,"
"Transform Boundary,"
"Folding,"
(All of the above are online activities).
"Volcanoes around the World"
(Google Earth File)
Mountain Types (slide show)

Investigation 7, Part 2, pp. 573-595
SE: *Rock Transformations,* pp. 88-92
How One Rock Becomes Another Rock, pp. 93-98
DR: "Appalachian Mountain Tour"
(Online Activity)
"How Metamorphic Rocks Form"
(Online Activity)

Investigation 9, Part 2 pp. 660-662

Disciplinary Core Ideas

ESS2.A: Earth Materials and Systems
All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produces chemical and physical changes in Earth's materials and living organisms.

Earth History

TE: Investigation 6, Part 1, pp. 415-421
DR: "Pacific Northwest Tour" (Online Activity), "Earth's Interior" (Slide Show"

Investigation 7, Part 1, 546-567
SE: *Earth's Dynamic Systems,* pp. 81-87
DR: "Convergent Boundary,"
"Divergent Boundary,"
"Transform Boundary,"
"Folding,"
(All of the above are online activities).
"Volcanoes around the World"
(Google Earth File)
Mountain Types (slide show)

Investigation 7, Part 2, pp. 573-595
SE: *Rock Transformations,* pp. 88-92
How One Rock Becomes Another Rock, pp. 93-98
DR: "Appalachian Mountain Tour"
(Online Activity)
"How Metamorphic Rocks Form"
(Online Activity)

Crosscutting Concepts

Energy and Matter
Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

Earth History
TE: Investigation 7, Part 1, 546-567
SE: *Earth's Dynamic Systems,* pp. 81-87
DR: "Convergent Boundary,"
"Divergent Boundary,"
"Transform Boundary,"
"Folding,"
(All of the above are online activities).
"Volcanoes around the World"
(Google Earth File)
Mountain Types (slide show)

Investigation 7, Part 2, pp. 573-595
SE: *Rock Transformations,* pp. 88-92
How One Rock Becomes Another Rock, pp. 93-98
DR: "Appalachian Mountain Tour"
(Online Activity)
"How Metamorphic Rocks Form"
(Online Activity)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Stability and Change
Cause and Effect
Systems and System Models

GRADE 6

Earth's Systems

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-ESS2-2

Students who demonstrate understanding can:
Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

***Clarification Statement**: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually, but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.*
***Assessment Boundary**: Assessment does not include identification or naming of specific events.*

Earth History
TE: Investigation 1, Part 1: notebook entry
Investigation 2, Part 1: notebook entry
Investigation 2, Part 2: response sheet
Investigation 2, Part 3: response sheet; Investigation 2 I-Check
Investigation 3, Part 2: notebook entry
Investigation 3, Part 3: notebook entry
Investigation 5, Part 1: performance assessment
Investigation 5, Part 3: notebook entry
Investigation 6, Part 1: performance assessment
Investigation 6, Part 2: notebook entry
Investigation 6, Part 3: notebook entry; Investigation 6 I-Check
Investigation 7, Part 1: notebook entry
Investigation 7, Part 2: performance assessment

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past, and will continue to do so in the future.

Earth History
TE: Investigation 1, Part , pp. 117-130
SE: *Seeing Earth*, pp. 3-6 , *Landforms Gallery,* pp. 132-135 , *Landforms Vocabulary,* p. 136
DR: Google Earth™; "Landforms Tour" (Online Activity)

Investigation 2, Part 1, pp. 190-
SE: *Grand Canyon Flood,* pp. 12-19,

Disciplinary Core Ideas

ESS2.A: Earth Materials and Systems
The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.

ESS2.C: The Roles of Water in Earth's Surface Processes

Water's movements - both on the land and Underground - cause weathering and erosion, which change the land's surface features and create underground formations.

Earth History
TE: Investigation 2, Part 1, pp. 190- 201
SE: *Grand Canyon Flood,* pp. 12-19, *Wentworth Scale of Rock Particle Sizes,* p. 159, *Colorado Plateau Map,* p. 153
DR: Stream Table: High Flow vs. Low Flow (Video), Stream Table: High Slope vs. Low Slope (Video), Stream Table:: Heterogeneous vs.

Crosscutting Concepts

Scale, Proportion, and Quantity
Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Earth History
TE: Investigation 2, Part 1, pp. 190- 201
SE: *Grand Canyon Flood,* pp. 12-19, *Wentworth Scale of Rock Particle Sizes,* p. 159, *Colorado Plateau Map,* p. 153
DR: Stream Table: High Flow vs. Low Flow (Video), Stream Table: High Slope vs. Low Slope (Video), Stream Table Heterogeneous vs. Homogeneous Material (Video), Glen Canyon Dam High Flow Experiment, USGS (Video)

Investigation 2, Part 2, pp. 208-226
SE: *Weathering and Erosion,* pp. 20-26, *Erosion on the Colorado Plateau, pp. 155-158, Wentworth Scale of Rock Particle Sizes,* p. 159, *Sand Analysis,* pp. 160-161
Sand on the Move, p. 162

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

Wentworth Scale of Rock Particle Sizes, p. 159, *Colorado Plateau Map,* p. 153

DR: Stream Table: High Flow vs. Low Flow (Video), Stream Table: High Slope vs. Low Slope (Video), Stream Table Heterogeneous vs. Homogeneous Material (Video), Glen Canyon Dam High Flow Experiment, USGS (Video)

Investigation 2, Part 2, pp. 208-226
SE: *Weathering and Erosion,* pp. 20-26, *Erosion on the Colorado Plateau, pp. 155-158, Wentworth Scale of Rock Particle Sizes,* p. 159, *Sand Analysis,* pp. 160-161 *Sand on the Move,* p. 162
DR: Freezing Glass Bottle (Video), Debris Flow (Video), Rock Fall (Video), Frost Wedging (Video)

Investigation 2, Part 3, pp. 232-240
SE: *Soil Stories,* pp. 27-33, *Wentworth Scale of Rock Particle Sizes,* p. 159

Investigation 3, Part 2, pp. 282-289
SE: *Where in the World is Calcium Carbonate?* Pp. 34-39

Investigation 3, Part 3, pp. 294-302
DR: "Rock Column Movie Maker" (Online Activity), "Sedimentary Rocks Tour" (Online Activity), "Rock Database" (Online Activity), Google Earth™

Investigation 5, Part 1, pp. 415-421
DR: "Earth's Interior" (Online Slide Show), "Pacific Northwest Tour (Online Activity)

Investigation 5, Part 3, pp. 447-453
SE: *Map of the Pacific Northwest: Igneous Rock Locations,* p. 185; *Typical Earth Rocks,* pp. 179-181
DR: "Rock Database" (Online Activity)

Investigation 6, Part 1, pp. 478-487
SE: *Volcanoes,* pp. 186-189
DR: Mount St. Helens: The Eruption (Video) ShakeAlert (Video) "Volcanoes" (Online Activity), "Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity)

Investigation 6, Part 2, pp. 490-495
DR: ,"Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity), "Wegener" Questions and Answers (Video)

Investigation 6, Part 3, pp. 500-519
SE: *The History of the Theory of Plate Tectonics,* pp. 74-79

Homogeneous Material (Video), Glen Canyon Dam High Flow Experiment, USGS (Video)

Investigation 2, Part 2, pp. 208-226
SE: *Weathering and Erosion,* pp. 20-26, *Erosion on the Colorado Plateau, pp. 155-158, Wentworth Scale of Rock Particle Sizes,* p. 159, *Sand Analysis,* pp. 160-161 *Sand on the Move,* p. 162
DR: Freezing Glass Bottle (Video), Debris Flow (Video), Rock Fall (Video), Frost Wedging (Video)

Investigation 2, Part 3, pp. 232-240
SE: *Soil Stories,* pp. 27-33, *Wentworth Scale of Rock Particle Sizes,* p. 159

Investigation 3, Part 2, pp. 282-289
SE: *Where in the World is Calcium Carbonate?* Pp. 34-39

Investigation 3, Part 3, pp. 294-302
DR: "Rock Column Movie Maker" (Online Activity), "Sedimentary Rocks Tour" (Online Activity), "Rock Database" (Online Activity), Google Earth™

Investigation 5, Part 1, pp. 415-421
DR: "Earth's Interior" (Online Slide Show), "Pacific Northwest Tour (Online Activity)

Investigation 5, Part 3, pp. 447-453
SE: *Map of the Pacific Northwest: Igneous Rock Locations,* p. 185; *Typical Earth Rocks,* pp. 179-181
DR: "Rock Database" (Online Activity)

Investigation 6, Part 1, pp. 478-487
SE: *Volcanoes,* pp. 186-189
DR: Mount St. Helens: The Eruption (Video) ShakeAlert (Video) "Volcanoes" (Online Activity), ,"Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity)

Investigation 6, Part 2, pp. 490-495
DR: ,"Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity), "Wegener" Questions and Answers (Video)

Investigation 6, Part 3, pp. 500-519
SE: *The History of the Theory of Plate Tectonics,* pp. 74-79 *Historical Debates about a Dynamic Earth,* p. 80

DR: Freezing Glass Bottle (Video), Debris Flow (Video), Rock Fall (Video), Frost Wedging (Video)

Investigation 2, Part 3, pp. 232-240
SE: *Soil Stories,* pp. 27-33, *Wentworth Scale of Rock Particle Sizes,* p. 159

Investigation 3, Part 3, pp. 294-302
DR: "Rock Column Movie Maker" (Online Activity), "Sedimentary Rocks Tour" (Online Activity), "Rock Database" (Online Activity), Google Earth™

Investigation 6, Part 1, pp. 478-487
SE: *Volcanoes,* pp. 186-189
DR: Mount St. Helens: The Eruption (Video) ShakeAlert (Video) "Volcanoes" (Online Activity), "Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity)

Historical Debates about a Dynamic Earth, p. 80
DR: Convection Tank (Video), NOAA Plate Tectonics (Video)

Investigation 7, Part 1, pp. 546-567
SE: *Earth's Dynamic Systems,* pp. 81-87
DR: "Convergent Boundary,"
"Divergent Boundary,"
"Transform Boundary,"
"Folding,"
(All of the above are online activities).
"Volcanoes around the World"
(Google Earth™ File)
Mountain Types (slide show)

Investigation 7, Part 2, pp. 573-579
SE: *Rock Transformations*, pp. 88-92; *How One Rock Becomes Another Rock,* pp. 93 98
DR: "Appalachian Mountain Tour" (Online Activity), Google Earth™

DR: Convection Tank (Video), NOAA Plate Tectonics (Video)

Investigation 7, Part 1, pp. 546-567
SE: *Earth's Dynamic Systems,* pp. 81-87
DR: "Convergent Boundary,"
"Divergent Boundary,"
"Transform Boundary,"
"Folding,"
(All of the above are online activities).
"Volcanoes around the World"
(Google Earth™ File)
Mountain Types (slide show)

Investigation 7, Part 2, pp. 573-579
SE: *Rock Transformations*, pp. 88-92; *How One Rock Becomes Another Rock,* p. 93-98
DR: "Appalachian Mountain Tour" (Online Activity), Google Earth™

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Stability and Change
Cause and Effect
Systems and System Models

GRADE 6

Earth's Systems

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-ESS2-3

Students who demonstrate understanding can:
Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

***Clarification Statement**: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), the locations of ocean structures (such as ridges, fracture zones, and trenches), and the prevalence of earthquakes and volcanoes along plate boundaries.*
***Assessment Boundary**: Paleomagnetic anomalies in oceanic and continental crust are not assessed.*

Earth History
TE: Investigation 6, Part 1: performance assessment
Investigation 6, Part 2: notebook entry
Investigation 6, Part 3: notebook entry; Investigation 6 I-Check
Investigation 7, Part 1: notebook entry

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basis statistical techniques of data and error analysis

Analyze and interpret data to provide evidence for phenomena.

Earth History
TE: Investigation 6, Part 1, pp. 478-487
SE: *Volcanoes,* pp. 186-189
DR: Mount St. Helens: The Eruption (Video)
ShakeAlert (Video) "Volcanoes" (Online Activity), , "Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity)

Investigation 6, Part 2, pp. 490-495
DR: ,"Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity), "Wegener" Questions and Answers (Video)

Disciplinary Core Ideas

ESS2.B: Plate Tectonics and Large-Scale System Interactions
Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geological history.

Plate movements are responsible for most continental and ocean floor features and for the distribution of most rocks and minerals within the Earth's crust.

Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.

ETS2.A: Interdependence of Science, Engineering, and Technology
Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.

Earth History
TE: Investigation 6, Part 1, pp. 478-487
SE: *Volcanoes,* pp. 186-189
DR: Mount St. Helens: The Eruption (Video), ShakeAlert (Video) "Volcanoes" (Online Activity), ,"Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity)

Investigation 6, Part 2, pp. 490-495
DR: ,"Volcanoes around the World"

Crosscutting Concepts

Patterns
Patterns in rates of change and other numerical relationships can provide information about natural systems.

Earth History
TE: Investigation 6, Part 1, pp. 478-487
SE: *Volcanoes,* pp. 186-189
DR: Mount St. Helens: The Eruption (Video)
ShakeAlert (Video) "Volcanoes" (Online Activity), ,"Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity)

Investigation 6, Part 2, pp. 490-495
DR: ,"Volcanoes around the World" (Online Activity), "Earthquakes around the World" (Online Activity), "Wegener" Questions and Answers (Video)

	(Online Activity), "Earthquakes around the World" (Online Activity), "Wegener" Questions and Answers (Video) Investigation 6, Part 3, pp. 500-519 **SE:** *The History of the Theory of Plate Tectonics,* pp. 74-79 *Historical Debates about a Dynamic Earth,* p. 80 **DR:** Convection Tank (Video), NOAA Plate Tectonics (Video) Investigation 7, Part 1, 546-567 **SE:** *Earth's Dynamic Systems,* pp. 81-87 **DR:** "Convergent Boundary," "Divergent Boundary," "Transform Boundary," "Folding," (All of the above are online activities). "Volcanoes around the World" (Google Earth File) Mountain Types (slide show)	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Asking Questions and Defining Problem
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Energy and Matter
Stability and Change
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 6

Earth's Systems

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-ESS2-4

Students who demonstrate understanding can:
Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

***Clarification Statement**: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.*
***Assessment Boundary**: Assessment does not include a quantitative understanding of the latent heats of vaporization and fusion.*

Weather and Water
TE: Investigation 7, Part 1: performance assessments
Investigation 7, Part 2: response sheet
Investigation 7, Part 3: notebook entry; Investigation 7 I-Check
Investigation 8, Part 1: notebook entry
Investigation 8, Part 2: notebook entry
Investigation 8, Part 3: performance assessment; Investigation 8 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe phenomena.

Weather and Water
TE: Investigation 7, Part 1, pp. 501-506

Investigation 7, Part 2, pp, 509-515

Investigation 7, Part 3, pp. 520-530
SE: *Observing Clouds,* pp. 124-125, *Raindrops and Cloud Droplets,* p.123

Investigation 8, Part 1, pp. 551-566
SE: *Earth: The Water Planet,* pp. 91-95

Investigation 8, Part 2, pp. 568-580
SE: *Ocean Currents and Gyres,* pp. 96-102
DR: Perpetual Ocean (Video)

Disciplinary Core Ideas

ESS2.C: The Roles of Water in Earth's Surface Processes
Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.

Global movements of water and its changes in form are propelled by sunlight and gravity.

Weather and Water
TE: Investigation 7, Part 1, pp. 501-506

Investigation 7, Part 2, pp, 509-515

Investigation 7, Part 3, pp. 520-530
SE: *Observing Clouds,* pp. 124-125, *Raindrops and Cloud Droplets,* p.123

Investigation 8, Part 1, pp. 551-566
SE: *Earth: The Water Planet,* pp. 91-95

Investigation 8, Part 2, pp. 568-580
SE: *Ocean Currents and Gyres,* pp. 96-102
DR: Perpetual Ocean (Video)

Investigation 8, Part 3, pp. 584-595
SE: *El Nino,* pp. 103-104

Crosscutting Concepts

Energy and Matter
Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

Weather and Water
TE: Investigation 7, Part 2, pp, 509-515

Investigation 7, Part 3, pp. 520-530
SE: *Observing Clouds,* pp. 124-125, *Raindrops and Cloud Droplets,* p.123

Investigation 8, Part 1, pp. 551-566
SE: *Earth: The Water Planet,* pp. 91-95

Investigation 8, Part 2, pp. 568-580
SE: *Ocean Currents and Gyres,* pp. 96-102
DR: Perpetual Ocean (Video)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed
Planning and Carrying Out Investigations
Asking Questions
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions

Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity

GRADE 6

Earth's Systems

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-ESS2-5

Students who demonstrate understanding can:
Analyze and interpret data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

***Clarification Statement**: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).*
***Assessment Boundary**: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.*

Weather and Water
TE: Investigation 2, Part 1: response sheet
Investigation 2, Part 2: performance assessment; Investigation 2 I-Check
Investigation 3, Part 2, performance assessment
Investigation 3, Part 3: notebook entry; Investigation 3 I-Check
Investigation 6, Part 1: notebook entry
Investigation 6, Part 2: notebook entry
Investigation 6, Part 3: notebook entry, Investigations 5-6 I-Check
Investigation 10, Part 1: performance assessment

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basis statistical techniques of data and error analysis

Analyze and interpret data to provide evidence for phenomena.

Weather and Water
TE: Investigation 1, Part 2, pp. 146-150

Investigation 2, Part 1, pp. 202-206

Investigation 3, Part 2, pp. 268-275

Investigation 6, Part 3, pp. 462-467

Disciplinary Core Ideas

ESS2.C: The Roles of Water in Earth's Surface Processes
The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.

ESS2.D Weather and Climate
Because these patterns are so complex, weather can only be predicted probabilistically.

Weather and Water
TE: Investigation 1, Part 1, pp. 136-141

Investigation 1, Part 2, pp. 146-157
DR: "Gas in a Syringe" (Online Activity)

Investigation 2, Part 1, pp. 202-219
SE: *What is Air Pressure?* Pp. 32-40
DR: Barometer in a Bottle (Video), "Gas in a Syringe" (Online Activity), "Weather-Balloon Simulation" (Online Activity), "Barometer in a Bottle" (Online Activity)

Investigation 2, Part 2, pp. 222-229

Investigation 3, Part 2, pp. 268-283
SE: *Density,* pp. 41-45

Crosscutting Concepts

Cause and Effect
Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.

Weather and Water
TE: Investigation 1, Part 2, pp. 146-157
DR: "Gas in a Syringe" (Online Activity)

Investigation 2, Part 1, pp. 202-219
SE: *What is Air Pressure?* Pp. 32-40
DR: Barometer in a Bottle (Video), "Gas in a Syringe" (Online Activity), "Weather-Balloon Simulation" (Online Activity), "Barometer in a Bottle" (Online Activity)

Investigation 2, Part 2, pp. 222-229

Investigation 3, Part 2, pp. 268-283
SE: *Density,* pp. 41-45
DR: Fluid Convection (Video), "Particles in Solids, Liquids, and Gases" (Online Activity)

Investigation 3, Part 3, pp. 288-295
SE: *Convection,* pp. 51-52
DR: "Energy Transfer: Conduction,

	DR: Fluid Convection (Video), "Particles in Solids, Liquids, and Gases" (Online Activity) Investigation 3, Part 3, pp. 288-295 **SE:** *Convection,* pp. 51-52 **DR:** "Energy Transfer: Conduction, Radiation, Convection" (Online Activity) Investigation 6, Part 1, pp. 436-448 **SE:** *Heating the Atmosphere,* pp. 69-75 Investigation 6, Part 2, pp. **DR:** "Local Wind: (Online Activity) Investigation 6, Part 3, pp. **SE:** *Radar Images of Cloud Cover*, p. 122; *Wind on Earth,* pp. 76-84 **DR:** NOAA Ridge (Video), Red Spot Movie (Video) Investigation 10, Part 1: pp. 673-680 **DR:** "Weather Maps" (Online Activity)	Radiation, Convection" (Online Activity) Investigation 6, Part 1, pp. 436-448 **SE:** *Heating the Atmosphere,* pp. 69-75 Investigation 6, Part 2, pp. **DR:** "Local Wind: (Online Activity) Investigation 6, Part 3, pp. **SE:** *Radar Images of Cloud Cover*, p. 122; *Wind on Earth,* pp. 76-84 **DR:** NOAA Ridge (Video), Red Spot Movie (Video) Investigation 10, Part 1: pp. 673-680 **DR:** "Weather Maps" (Online Activity)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Stability and Change
Energy and Matter
Systems and System Models
Scale, Proportion, and Quantity

GRADE 6

Earth's Systems

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-ESS2-6

Students who demonstrate understanding can:
Develop and use models to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

***Clarification Statement**: Emphasis is on patterns of global and regional climate that vary due to atmospheric circulation, oceanic circulation, and geographic land features.*
***Assessment Boundary**: Assessment does not include the dynamics of the Coriolis Effect, thermohaline circulation, or the role of density.*

Weather and Water
TE: Investigation 6, Part 1: notebook entry
Investigation 6, Part 2: notebook entry
Investigation 6, Part 3: notebook entry; Investigation 6 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe phenomena.

Weather and Water
TE: Investigation 6, Part 1, pp. 436-448
SE: *Heating the Atmosphere,* pp. 69-75

Investigation 6, Part 2, pp. 451-456
DR: "Local Wind" (Online Activity)

Investigation 6, Part 3, pp. 462-481
SE: *Wind on Earth,* pp. 76-84
DR: Red Spot Movie (Video)

Investigation 8, Part 2, pp. 568-580
SE: *Ocean Currents and Gyres,* pp. 96-102
DR: Perpetual Ocean (Video)

Investigation 8, Part 3, pp. 584-595
SE: *El Nino,* pp. 103-104

Disciplinary Core Ideas

ESS2.C: The Roles of Water in Earth's Surface Processes
Variations in density due to variations in temperature and salinity drive a global pattern on interconnected ocean currents.

ESS2.D: Weather and Climate
The tilt of the earth's rotational axis causes a pattern of uneven heating and cooling that changes seasonally and establishes global patterns of climate and weather.

Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.

The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.

Weather and Water
TE: Investigation 6, Part 1, pp. 436-448
SE: *Heating the Atmosphere,* pp. 69-75

Investigation 6, Part 2, pp. 451-456
DR: "Local Wind" (Online Activity)

Investigation 6, Part 3, pp. 462-481
SE: *Wind on Earth,* pp. 76-84
DR: Red Spot Movie (Video)

Investigation 8, Part 2, pp. 568-580

Crosscutting Concepts

Systems and System Models
Models can be used to represent systems and their interactions - such as inputs, processes, and outputs - and energy, matter, and information flows within systems.

Weather and Water
TE: Investigation 6, Part 3, pp. 462-481
SE: *Wind on Earth,* pp. 76-84
DR: Red Spot Movie (Video)

Investigation 8, Part 3, pp. 584-595
SE: *El Nino,* pp. 103-104

	SE: *Ocean Currents and Gyres,* pp. 96-102 **DR**: Perpetual Ocean (Video) Investigation 8, Part 3, pp. 584-595 **SE:** *El Nino,* pp. 103-104	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Planning and Carrying Out Investigations
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Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Stability and Change
Cause and Effect
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Structure and Function

GRADE 6

Earth and Human Activity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 6-ESS3-2

Students who demonstrate understanding can:

Analyze and interpret data on natural hazards to identify patterns, which help forecast future catastrophic events and inform the development of technologies to mitigate their effects.

***Clarification Statement**: Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires), or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).*

Earth History
TE: Investigation 6, Part 1: notebook entry, I-Check

Weather and Water
TE: Investigation 9, Part 1: performance assessment
Investigation 9, Part 2: notebook entry
Investigation 9, Part 3: performance assessment; Investigation 9 I-Check

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basis statistical techniques of data and error analysis

Analyze and interpret data to provide evidence for phenomena.

Earth History
TE: Investigation 6, Part 1, pp. 486-487, p. 520
DR: ShakeAlert (Video)

Weather and Water
TE: Investigation 9, Part 1, pp. 616-622
DR: "Earth's Climate Over Time" (Slide Show)

Investigation 9, Part 2: pp. 626-
SE: *Climates, Past, Present and Future,* pp. 105-110
DR: Carbon Cycle (Video) "Greenhouse-Gas Simulator" (Online Activity), "Human-Caused Sources of Carbon Dioxide" (Online Activity)

Disciplinary Core Ideas

ESS3.B: Natural Hazards
Some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable.

Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces, can help forecast the locations and likelihoods of future events.

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World
The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings oof scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time.

Earth History
TE: Investigation 6, Part 1, pp. 486-487, p. 520
DR: ShakeAlert (Video)

Weather and Water
TE: Investigation 1, Part 1, pp. 132-136
SE: *Severe Weather,* pp. 3-17
DR: Hurricanes and Tornadoes (Video)

Investigation 9, Part 1, pp. 616-622

Crosscutting Concepts

Patterns
Graphs, charts, and images can be used to identify patterns in data.

Earth History
TE: Investigation 6, Part 1, pp. 486-487, p. 520
DR: ShakeAlert (Video)

Weather and Water
TE: Investigation 9, Part 1, pp. 616-622
DR: "Earth's Climate Over Time" (Slide Show)

Investigation 9, Part 2:
SE: *Climates, Past, Present and Future,* pp. 105-110
DR: Carbon Cycle (Video) "Greenhouse-Gas Simulator" (Online Activity), "Human-Caused Sources of Carbon Dioxide" (Online Activity)

Investigation 9, Part 3: pp. 648-657
DR: Climate Change Basics (Video) "Water Cycle" (Online Activity - select "Global Warming" setting)

	DR: "Earth's Climate Over Time" (Slide Show) Investigation 9, Part 2, pp. 626- **SE:** *Climates, Past, Present and Future,* pp. 105-110 **DR:** Carbon Cycle (Video) "Greenhouse-Gas Simulator" (Online Activity) "Human-Caused Sources of Carbon Dioxide" (Online Activity) Investigation 9, Part 3: pp. 648-657 **DR:** Climate Change Basics (Video) "Water Cycle" (Online Activity - select "Global Warming" setting)	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Energy and Matter
Stability and Change
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 7

Matter and Its Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-PS1-1

Students who demonstrate understanding can:
Develop models to describe the atomic composition of simple molecules and extended structures.

***Clarification Statement**: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended atomic structures will assist students in making sense of different phenomena such as how diamonds and graphite can both be made of pure carbon. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.*
***Assessment Boundary**: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure*

Chemical Interactions
TE: Investigation 2, Part 1: performance assessment
Investigation 2, Part 2: response sheet; Investigation 2 I-Check
Investigation 9, Part 1: notebook entry; Investigation 9 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena.

Develop a model to predict and/or describe phenomena.

Chemical Interactions
TE: Investigation 2, Part 1, pp.
SE: *Elements,* pp. 3-12
DR: "Periodic Table of Elements" (Online Activity)

Investigation 2, Part 2, pp. 189-199
SE: *Substances on Earth,* pp.13-14; *Elements in the Universe,* pp. *15-23*
DR: "Periodic Table of Elements" (Online Activity)

Investigation 9, Part 1, pp. 558-575
SE: *Better Living Through Chemistry,* pp. 110-117; *Atoms and Compounds,* p. 180; *Compound Structure,* p. 181; *Organic Compounds,* pp. 141-147

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter
Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.

Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).

Chemical Interactions
TE: Investigation 2, Part 1, pp.
SE: *Elements,* pp. 3-12
DR: "Periodic Table of Elements" (Online Activity)

Investigation 2, Part 2, pp. 189-199
SE: *Substances on Earth,* pp. 13-14; *Elements in the Universe,* pp. *15-23*
DR: "Periodic Table of Elements" (Online Activity)

Investigation 9, Part 1, pp. 558-575
SE: *Better Living Through Chemistry,* pp. 110-117; *Atoms and Compounds,* p. 180; *Compound Structure,* p. 181; *Organic Compounds,* pp. 141-147

Crosscutting Concepts

Scale, Proportion, and Quantity
Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Chemical Interactions
TE: Investigation 2, Part 2, pp. 189-199
SE: *Substances on Earth,* pp. 13-14; *Elements in the Universe,* pp. *15-23*
DR: "Periodic Table of Elements" (Online Activity)

Investigation 9, Part 1, pp. 558-575
SE: *Better Living Through Chemistry,* pp. 110-117; *Atoms and Compounds,* p. 180; *Compound Structure,* p. 181; *Organic Compounds,* pp. 141-147

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed
Constructing Explanations and Designing Solutions
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Cause and Effect
Systems and System Models
Structure and Function

GRADE 7

Matter and Its Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-PS1-2

Students who demonstrate understanding can:
Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

***Clarification Statement**: Examples of reactions could include burning sugar or steel wool, milk curdling, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.*
***Assessment Boundary**: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.*

Chemical Interactions
TE: Investigation 1, Part 1: notebook entry
Investigation 1, Part 2: performance assessment
Investigation 9, Part 1: notebook entry
Investigation 9, Part 2: performance assessment
Investigation 9, Part 3: response sheet; Investigation 9 I-Check
Investigation 10, Part 1: notebook entry

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 6-8 builds on K-5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basis statistical techniques of data and error analysis

Analyze and interpret data to determine similarities and differences in findings.

Chemical Interactions
TE: Investigation 1, Part 1, pp. 123-128

Investigation 1, Part 2, pp. 135-147
SE: *White Substances Information,* pp. 165-173
DR: "Two-Substance Reactions" (Online Activity)

Investigation 9, Part 2, pp. 583-605
SE: *How Do Atoms Rearrange?* Pp. 118-129; *Fireworks,* pp. 130-133
DR: Burning Sugar Demonstration (Video)

Investigation 9, Part 3, pp. 611-623

Investigation 10, Part 1, pp. 642-649

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter
Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.

PS1.B: Chemical Reactions
Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.

Chemical Interactions
TE: Investigation 1, Part 1, pp. 123-128

Investigation 1, Part 2, pp. 135-147
SE: *White Substances Information,* pp. 165-173
DR: "Two-Substance Reactions" (Online Activity)

Investigation 9, Part 1, pp. 558-565
SE: *Atoms and Compounds,* p. 180; *Compound Structure,* p. 181

Investigation 9, Part 2, pp. 583-605
SE: *How Do Atoms Rearrange?* Pp. 118-129; *Fireworks,* pp. 130-133
DR: Burning Sugar Demonstration (Video)

Investigation 9, Part 3, pp. 611-623

Investigation 10, Part 1, pp. 642-649

Crosscutting Concepts

Patterns
Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

Chemical Interactions
TE: Investigation 1, Part 2, pp. 135-147
SE: *White Substances Information,* pp. 165-173
DR: "Two-Substance Reactions" (Online Activity)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Energy and Matter
Stability and Change
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 7

Matter and Its Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-PS1-3

Students who demonstrate understanding can:
Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

***Clarification Statement**: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, plastic made from petroleum, and alternative fuels.*
***Assessment Boundary**: Assessment is limited to qualitive data.*

Chemical Interactions
TE: Investigation 9, Part 1: notebook entry; I-Check

Science and Engineering Practices

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 6-8 builds upon K-5 experiences and progresses to evaluating the merit and validity of ideas and methods.

Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.

Chemical Interactions
TE: Investigation 9, Part 1, pp. 565-573
SE: *Better Living Through Chemistry,* pp. 110-117

Disciplinary Core Ideas

PS1.A: Structures and Properties of Matter
Each pure substance has characteristics, physical and chemical properties (for any bulk quantity under given conditions), that can be used to identify it.

PS1.B: Chemical Reactions
Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.

Chemical Interactions
TE: Investigation 9, Part 1, pp. 565-573
SE: *Better Living Through Chemistry,* pp. 110-117

ETS2.A: Interdependence of Science, Engineering, and Technology
Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World
The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region.

Variables and Design
Investigation 1: Testing Variables
Investigation 2, Part 2: Engineering Design Cycle

Crosscutting Concepts

Structure and Function
Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

Chemical Interactions
TE: Investigation 9, Part 1, pp. 565-573
SE: *Better Living Through Chemistry,* pp. 110-117

Variables and Design
Investigation 1: response sheet
Investigation 2: I-Check
Investigation 3: performance assessment

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigation Listed

Developing and Using Models

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigation Listed

Cause and Effect
Systems and System Models

GRADE 7

Matter and Its Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-PS1-5

Students who demonstrate understanding can:
Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

***Clarification Statement**: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms that represent atoms.*
***Assessment Boundary**: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces. or intermolecular forces.*

Chemical Interactions
TE: Investigation 9, Part 1: notebook entry
Investigation 9, Part 2: performance assessment
Investigation 9, Part 3: response sheet; I-Check
Investigation 10, Part 1: notebook entry

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe phenomena.

Chemical Interactions
TE: Investigation 9, Part 1, pp. 558-565
SE: *Atoms and Compounds,* p. 180; *Compound Structure,* p. 181

Investigation 9, Part 2, pp. 583-605
SE: *How Do Atoms Rearrange?* Pp. 118-129; *Fireworks,* pp. 130-133
DR: Burning Sugar Demonstration (Video)

Investigation 9, Part 3, pp. 611-623
SE: *Antoine-Laurent Lavoisier: The Father of Modern Chemistry,* pp. 134-140; *Organic Compounds*, pp. 141-147

Investigation 10, Part 1, pp. 642-649

Disciplinary Core Ideas

PS1.B: Chemical Reactions
Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.

The total number of each type of atom is conserved, and thus the mass does not change. Some chemical reactions release energy, others store energy.

Chemical Interactions
TE: Investigation 9, Part 1, pp. 558-565
SE: *Atoms and Compounds,* p. 180; *Compound Structure,* p. 181

Investigation 9, Part 2, pp. 583-605
SE: *How Do Atoms Rearrange?* Pp. 118-129; *Fireworks,* pp. 130-133
DR: Burning Sugar Demonstration (Video)

Investigation 9, Part 3, pp. 611-623
SE: *Antoine-Laurent Lavoisier: The Father of Modern Chemistry,* pp. 134-140; *Organic Compounds*, pp. 141-147

Investigation 10, Part 1, pp. 642-649

Crosscutting Concepts

Energy and Matter
Matter is conserved because atoms are conserved in physical and chemical processes.

Chemical Interactions
TE: Investigation 9, Part 2, pp. 583-605
SE: *How Do Atoms Rearrange?* Pp. 118-129; *Fireworks,* pp. 130-133
DR: Burning Sugar Demonstration (Video)

Investigation 9, Part 3, pp. 611-623
SE: *Antoine-Laurent Lavoisier: The Father of Modern Chemistry,* pp. 134-140; *Organic Compounds*, pp. 141-147

Investigation 10, Part 1, pp. 642-649

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Stability and Change
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 7

Matter and Its Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-PS1-6

Students who demonstrate understanding can:
Undertake a design project to construct, test, and modify a device that releases or absorbs thermal energy by chemical processes.

***Clarification Statement**: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride, combining baking soda and vinegar, or combining sodium bicarbonate tablets and water.*
***Assessment Boundary**: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.*

Chemical Interactions
TE: Investigation 6, Part 1: notebook entry
Investigation 6, Part 2: performance assessment
Investigations 7-8 I-Check

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progressed to include constructing explanations and designing solutions supported by multiple sources of evide4nce consistent with scientific ideas, principles, and theories.

Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints

Chemical Interactions
TE: Investigation 6, Part 1
DR: "Energy Flow" (Online Activity), "Particles in Solids, Liquids, and Gases" (Online Activity)

Investigation 6, Part 2
SE: *Engineering a Better Design,* pp. 56-63; *Science Practices,* p. 182; *Engineering Practices,* p. 183

Disciplinary Core Ideas

PS1.B: Chemical Reactions
Some chemical reactions release energy, others store energy.

Chemical Interactions
TE: Investigation 6, Part 1
DR: "Energy Flow" (Online Activity), "Particles in Solids, Liquids, and Gases" (Online Activity)

Investigation 6, Part 2
SE: *Engineering a Better Design,* pp. 56-63; *Science Practices,* p. 182; *Engineering Practices,* p. 183

ETS1.B: Developing Possible Solutions
A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.

ETS1.C: Optimizing the Design Solution
Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process – that is, some of the characteristics may be incorporated into the new design. The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Variables and Design
Investigation 2: Testing Designs
Investigation 3: Real World Problems

Crosscutting Concepts

Energy and Matter
The transfer of energy can be tracked as energy flows through a designed or natural system.

Chemical Interactions
TE: Investigation 6, Part 1
DR: "Energy Flow" (Online Activity), "Particles in Solids, Liquids, and Gases" (Online Activity)

Investigation 6, Part 2
SE: *Engineering a Better Design,* pp. 56-63; *Science Practices,* p. 182; *Engineering Practices,* p. 183

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed
Developing and Using Models

Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Cause and Effect
Systems and System Models
Structure and Function

GRADE 7

Energy

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-PS3-1

Students who demonstrate understanding can:
Construct and interpret graphical displays of data to describe the proportional relationships of kinetic energy to the mass of an object and to the speed of an object.

***Clarification Statement**: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a whiffle ball versus a tennis ball.*
***Assessment Boundary**: Does not include mathematical calculations of kinetic energy.*

Gravity and Kinetic Energy
TE: Investigation 3, Part 1: performance assessment
Investigation 3, Part 2: notebook entry
Investigation 3, Part 3: notebook entry; Investigation 3 I-Check

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basis statistical techniques of data and error analysis.

Construct and interpret graphical displays of data to identify linear and nonlinear relationships.

Gravity and Kinetic Energy
TE: Investigation 3, Part 1, pp. 213-222

Investigation 3, Part 2, pp. 232-239
SE: *Avoiding Collisions,* pp. 42-44

Disciplinary Core Ideas

PS3.A: **Definitions of Energy**
Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.

Gravity and Kinetic Energy
TE: Investigation 3, Part 1, pp. 213-229
SE: *Potential and Kinetic Energy,* pp. 37-40

Investigation 3, Part 2, pp. 232-239
SE: *Avoiding Collisions,* pp. 42-44

Investigation 3, Part 3, pp.
SE: *Newton's Laws,* pp. 45-49

Crosscutting Concepts

Scale, Proportion, and Quantity
Proportional relationships (e.g., speed as a ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and process.

Gravity and Kinetic Energy
TE: Investigation 3, Part 1, pp. 213-229
SE: *Potential and Kinetic Energy,* pp. 37-40

Investigation 3, Part 2, pp. 232-239
SE: *Avoiding Collisions,* pp. 42-44

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed
Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Constructing Explanations and Designing Solutions
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed
Patterns
Energy and Matter
Stability and Change
Cause and Effect
Systems and System Models

GRADE 7

Energy

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-PS3-2

Students who demonstrate understanding can:

Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

***Clarification Statement**: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.*

***Assessment Boundary**: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.*

Gravity and Kinetic Energy

TE: Investigation 3, Part 1: performance assessment
Investigation 3, Part 2: notebook entry
Investigation 3, Part 3: notebook entry; Investigation 3 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop a model to describe unobservable mechanisms.

Gravity and Kinetic Energy
TE: Investigation 3, Part 1: Step 16, Step 19
Investigation 3, Part 2: Step 12
Investigation 3, Part 3: Step 18

Disciplinary Core Ideas

PS3.A: Definitions of Energy
A system of objects may also contain stored (potential) energy, depending on their relative positions.

PS3.C: Relationship Between Energy and Forces
When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.

Gravity and Kinetic Energy
TE: Investigation 3, Part 1, pp. 213-229
SE: *Potential and Kinetic Energy,* pp. 37-40

Investigation 3, Part 2, pp. 232-239
SE: *Avoiding Collisions,* pp. 42-44

Investigation 3, Part 3, pp.
SE: *Newton's Laws,* pp. 45-49

Crosscutting Concepts

Systems and System Models
Models can be used to represent systems and their interactions - such as inputs, processes, and outputs - and energy and matter flows within systems.

Gravity and Kinetic Energy
TE: Investigation 3, Part 1: Steps 14, 16
Investigation 3, Part 3: Step 18
DR: *Adding Magnet Fields* (Online Activity)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Asking Questions
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Stability and Change
Cause and Effect
Scale, Proportion, and Quantity

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

GRADE 7

Energy

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-PS3-5

Students who demonstrate understanding can:
Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

***Clarification Statement**: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.*
***Assessment Boundary**: Assessment does not include calculations of energy.*

Chemical Interactions
TE: Investigation 4, Part 1: performance assessment
Investigation 4, Part 2: response sheet
Investigation 4, Part 3: notebook entry; Investigation 4 I-Check
Investigation 5, Part 1: notebook entry
Investigation 5, Part 2: response sheet
Investigation 5, Part 3: performance assessment; Investigation 5 I-Check

Gravity and Kinetic Energy
TE: Investigation 3, Part 1: performance assessment
Investigation 3, Part 2: notebook entry
Investigation 3, Part 3: notebook entry; Investigation 3 I-Check

Science and Engineering Practices

Engaging in Argument from Evidence
Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon.

Disciplinary Core Ideas

PS3.B: Conservation of Energy and Energy Transfer
When the motion energy of an object changes, there is inevitably some other change in energy at the same time.

Chemical Interactions
TE: Investigation 4, Part 1, pp. 274-280

Investigation 4, Part 2, pp. 286-303
SE: *Particles in Motion,* pp. 33-39
Three Phases of Matter, pp. 28-32

Investigation 4, Part 3, pp. 307-
SE: *Expansion and Contraction,* pp. 40-45
DR: "Particles in Solids, Liquids, and Gases" (Online Activity)

Investigation 5, Part 1, pp. 333-339

Investigation 5, Part 2, pp. 342-359
SE: *Energy on the Move,* pp. 46-55
DR: "Energy Transfer by Collision (Online Activity), "Mixing Hot and Cold Water" (Online Activity), "Thermometer" (Online Activity), "Energy Flow" (Online Activity)

Crosscutting Concepts

Energy and Matter
Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).

Chemical Interactions
TE: Investigation 4, Part 1, pp. 274-280

Investigation 4, Part 2, pp. 286-303
SE: *Particles in Motion,* pp. 33-39
Three Phases of Matter, pp. 28-32

Investigation 4, Part 3, pp. 307-
SE: *Expansion and Contraction,* pp. 40-45
DR: "Particles in Solids, Liquids, and Gases" (Online Activity)

Investigation 5, Part 1, pp. 333-339

Investigation 5, Part 2, pp. 342-359
SE: *Energy on the Move,* pp. 46-55
DR: "Energy Transfer by Collision (Online Activity), "Mixing Hot and Cold Water" (Online Activity), "Thermometer" (Online Activity(, "Energy Flow" (Online Activity)

Investigation 5, Part 3, pp. 363-372
DR: "Mixing Hot and Cold Water"

	Investigation 5, Part 3, pp. 363-372 **DR**: "Mixing Hot and Cold Water" (Online Activity), "Energy Flow" (Online Activity) ***Gravity and Kinetic Energy*** **TE:** Investigation 3, Part 1, pp. 213-229 **SE:** *Potential and Kinetic Energy,* pp. 37-40 Investigation 3, Part 2, pp. 232-239 **SE:** *Avoiding Collisions,* pp. 42-44 Investigation 3, Part 3, pp. **SE:** *Newton's Laws,* pp. 45-49	(Online Activity), "Energy Flow" (Online Activity) ***Gravity and Kinetic Energy*** **TE:** Investigation 3, Part 1, pp. 213-229 **SE:** *Potential and Kinetic Energy,* pp. 37-40 Investigation 3, Part 2, pp. 232-239 **SE:** *Avoiding Collisions,* pp. 42-44 Investigation 3, Part 3, pp. **SE:** *Newton's Laws,* pp. 45-49

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Stability and Change
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 7

From Molecules to Organisms: Structures and Processes

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-LS1-6

Students who demonstrate understanding can:
Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

Clarification Statement: *Emphasis is on tracing movement of matter and flow of energy.*
Assessment Boundary*: Assessment does not include biochemical mechanisms of photosynthesis.*

Populations and Ecosystems
TE: Investigation 5, Part 2: response sheet
Investigation 5, Part 4: notebook entry; Investigation 5, I-Check
Investigation 6, Part 1: notebook entry

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Populations and Ecosystems
TE: Investigation 5, Part 1, pp. 359-367

Investigation 5, Part 2, pp.371-382
SE: *Energy and Life,* pp. 51-55, *Where Does Food Come From?* Pp. 56-61

Investigation 5, Part 4, pp. 394-402

Investigation 6, Part 1, pp. 424-429

Disciplinary Core Ideas

LS1.C: Organization for Matter and Energy Flow in Organisms
Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.

Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules (sugars) to provide energy and produce carbon dioxide; anaerobic bacteria achieve their energy needs in other chemical processes that do not require oxygen.

PS3.D: Energy in Chemical Processes and Everyday Life
The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen.

Populations and Ecosystems
TE: Investigation 5, Part 1, pp. 359-367

Investigation 5, Part 2, pp.371-382
SE: *Energy and Life,* pp. 51-55, *Where Does Food Come From?* pp. 56-61

Investigation 5, Part 4, pp. 394-402

Investigation 6, Part 1, pp. 424-429

Crosscutting Concepts

Energy and Matter
Within a natural system, the transfer of energy drives the motion and/or cycling of matter.

Populations and Ecosystems
TE: Investigation 5, Part 1, pp. 359-367

Investigation 5, Part 2, pp.371-382
SE: *Energy and Life,* pp. 51-55, *Where Does Food Come From?* Pp. 56-61

Investigation 5, Part 4, pp. 394-402

Investigation 6, Part 1, pp. 424-429

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity

GRADE 7

From Molecules to Organisms: Structures and Processes

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-LS1-7

Students who demonstrate understanding can:
Develop a model to describe how food molecules in plants and animals are rearranged through chemical reactions forming new molecules that support growth and/or release energy as matter moves through an organism.

***Clarification Statement**: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.*
***Assessment Boundary**: Assessment does not include details of the chemical reactions for photosynthesis or respiration.*

Populations and Ecosystems
TE: Investigation 5, Part 2: response sheet
Investigation 5, Part 4: notebook entry; Investigation 5 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
Develop a model to describe unobservable mechanisms.

Populations and Ecosystems
TE: Investigation 5, Part 2, pp.371-382
SE: *Energy and Life,* pp. 51-55, *Where Does Food Come From?* Pp. 56-61

TE: Investigation 5, Part 4, pp. 394-402

Disciplinary Core Ideas

LS1.C: Organization for Matter and Energy Flow in Organisms
Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or release energy.

PS3.D: Energy in Chemical Processes and Everyday Life
Cellular respiration in plants and animals involves chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.

Populations and Ecosystems
TE: Investigation 5, Part 2, pp.371-382
SE: *Energy and Life,* pp. 51-55, *Where Does Food Come From?* Pp. 56-61

TE: Investigation 5, Part 4, pp. 394-402

Crosscutting Concepts

Energy and Matter
Matter is conserved because atoms are conserved in physical and chemical processes.

Populations and Ecosystems
TE: Investigation 5, Part 2, pp.371-382
SE: *Energy and Life,* pp. 51-55, *Where Does Food Come From?* Pp. 56-61

Investigation 5, Part 4, pp. 394-402

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Planning and Carrying Out Investigations
Constructing Explanations and Designing Solutions
Using Mathematics and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Scale, Proportion, and Quantity
Systems and System Models
Structure and Function

GRADE 7

Ecosystems: Interactions, Energy, and Dynamics

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-LS2-1

Students who demonstrate understanding can:
Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

***Clarification Statement**: Emphasis is on cause-and-effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.*
***Assessment Boundary**: Assessment does not include determining the carrying capacity of ecosystems.*

Populations and Ecosystems
TE: Investigation 7, Part 1: notebook entry
Investigation 7, Part 2: performance assessment; notebook entry
Investigation 7, Part 3: notebook entry; Investigation 7 I-Check

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basis statistical techniques of data and error analysis

Analyze and interpret data to provide evidence for phenomena.

Populations and Ecosystems
Investigation 7, Part 1, pp. 497-508
SE: *Milkweed Bug,* pp. 7-12; *Milkweed-Bug Hatching Investigation,* pp. 133-135
DR: "Milkweed Bugs, Unlimited" (Online Activity)
"Milkweed Bugs, Limited" (Online Activity)

Investigation 7, Part 2, pp. 512-527
SE: *Algae and Brine Shrimp Experiments,* pp. 136-140

Investigation 7, Part 3, pp. 530-544
SE: *Mono Lake Data,* pp. 141-144

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems
Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.

In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.

Growth of organisms and population increases are limited by access to resources.

Populations and Ecosystems
Investigation 7, Part 1, pp. 497-508
SE: *Milkweed Bug,* pp. 7-12; *Milkweed-Bug Hatching Investigation,* pp. 133-135
DR: "Milkweed Bugs, Unlimited" (Online Activity)
"Milkweed Bugs, Limited" (Online Activity)

Investigation 7, Part 2, pp. 512-527
SE: *Limiting Factors,* pp. 87-96, *Algae and Brine Shrimp Experiments,* pp. 136-140

Investigation 7, Part 3, pp. 530-544
SE: *Mono Lake Data,* pp. 141-144; *Mono Lake throughout the Year,* pp. 97-99

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Crosscutting Concepts

Cause and Effect
Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Populations and Ecosystems
Investigation 7, Part 1, pp. 497-508
SE: *Milkweed-Bug Hatching Investigation,* pp. 133-135
DR: "Milkweed Bugs, Unlimited" (Online Activity)
"Milkweed Bugs, Limited" (Online Activity)

Investigation 7, Part 2, pp. 512-527
SE: *Limiting Factors,* pp. 87-96 , *Algae and Brine Shrimp Experiments,* pp. 136-140

Investigation 7, Part 3, pp. 530-544
SE: *Mono Lake Data,* pp. 141-144; *Mono Lake throughout the Year,* pp. 97-99

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed
Asking Questions

Developing and Using Models
Planning and Carrying Out Investigations
Using Mathematics and Computational Thinking
Constructing Explanations
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Stability and Change
Systems and System Models
Scale, Proportion, and Quantity

GRADE 7

Ecosystems: Interactions, Energy, and Dynamics

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-LS2-2

Students who demonstrate understanding can:
Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Clarification Statement: *Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competition, predatory, and mutually beneficial.*

Populations and Ecosystems
TE: Investigation 3, Part 1: notebook entry
Investigation 3, Part 2: response sheet
Investigation 3, Part 3: performance assessment; Investigation 3 I-Check
Investigation 4, Part 3: performance assessment
Investigation 7, Part 2: performance assessment
Investigation 7, Part 3: notebook entry; Investigation 7 I-Check
Investigation 8, Part 2: performance assessment

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.

Populations and Ecosystems
TE: Investigation 3, Part 1, pp. 248-258
SE: *An Introduction to Mono Lake,* pp. 35-40
DR: The Mono Lake Story (Video)

Investigation 3, Part 2, pp. 263-271
DR: "Mono Lake Food Web" (Online Activity)

Investigation 3, Part 3, pp. 276-281
DR: "Ecoscenarios" (Online Activity), "Organism Database" (Online Resource)

Investigation 4, Part 3, pp. 328-334

Investigation 7, Part 2,
SE: *Limiting Factors,* pp. 87-96

Investigation 7, Part 3, pp. 530-544
SE: *Mono Lake Data,* pp. 141-144; *Mono Lake throughout the Year,* pp. 97-99

Investigation 8, Part 2, pp. 585-590
DR: Hawaii: Strangers in Paradise (Video)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems
Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.

Populations and Ecosystems
TE: Investigation 3, Part 1, pp. 248-258
SE: *An Introduction to Mono Lake,* pp. 35-40
DR: The Mono Lake Story (Video)

Investigation 3, Part 2, pp. 263-271
DR: "Mono Lake Food Web" (Online Activity)

Investigation 3, Part 3, pp. 276-281
DR: "Ecoscenarios" (Online Activity), "Organism Database" (Online Resource)

Investigation 4, Part 3, pp. 328-334

Investigation 7, Part 2, 512-527
SE: *Limiting Factors,* pp. 87-96

Investigation 7, Part 3, pp. 530-544
SE: *Mono Lake Data,* pp.141-144; *Mono Lake throughout the Year,* pp. 97-99

Crosscutting Concepts

Patterns
Patterns can be used to identify cause-and-effect relationships.

Populations and Ecosystems
TE: Investigation 3, Part 2, pp. 263-271
DR: "Mono Lake Food Web" (Online Activity)

Investigation 3, Part 3, pp. 276-281
DR: "Ecoscenarios" (Online Activity), "Organism Database" (Online Resource)

Investigation 7, Part 2,
SE: *Limiting Factors,* pp. 87-96

Investigation 7, Part 3, pp. 530-544
SE: *Mono Lake Data,* pp. 141-144; *Mono Lake throughout the Year,* pp. 97-99

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

	Investigation 8, Part 2, pp. 585-590 **DR:** Hawaii: Strangers in Paradise (Video)	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Asking Questions
Developing and Using Models
Analyzing and Interpreting Data
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Energy and Matter
Stability and Change
Cause and Effect
Systems and System Models

GRADE 7

Ecosystems: Interactions, Energy, and Dynamics

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7.LS2.3

Students who demonstrate understanding can:
Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

***Clarification Statement**: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.*
***Assessment Boundary**: Assessment does not include the use of chemical reactions to describe the processes.*

Populations and Ecosystems
TE: Investigation 3, Part 1: notebook entry
Investigation 3, Part 2: response sheet
Investigation 3, Part 3: performance assessment; Investigation 3 I-Check
Investigation 5, Part 1: performance assessment
Investigation 5, Part 2: notebook entry
Investigation 5, Part 4: notebook entry; Investigation 5 I-Check
Investigation 6, Part 1: notebook entry
Investigation 6, Part 2: performance assessment
Investigation 6, Part 3: response sheet
Investigation 6, Part 4: notebook entry; Investigation 6 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop a model to describe phenomena.

Populations and Ecosystems
TE: Investigation 3, Part 1, pp. 248-258
SE: *An Introduction to Mono Lake,* pp. 35-40
DR: The Mono Lake Story (Video)

Investigation 3, Part 2, pp. 263-271
DR: "Mono Lake Food Web" (Online Activity)

Investigation 3, Part 3, pp. 276-281
DR: "Ecoscenarios" (Online Activity), "Organism Database" (Online Resource)

Investigation 5, Part 1, pp. 359-367

Investigation 5, Part 2, pp.371-382
SE: *Energy and Life,* pp. 51-55, *Where Does Food Come From?* Pp. 56-61

Investigation 5, Part 4, pp. 394-402

Investigation 6, Part 1, pp. 424-429

Investigation 6, Part 2, pp. 434-445

Disciplinary Core Ideas

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems
Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments.

The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.

Populations and Ecosystems
TE: Investigation 3, Part 1, pp. 248-258
SE: *An Introduction to Mono Lake,* pp. 35-40
DR: The Mono Lake Story (Video)

Investigation 3, Part 2, pp. 263-271
DR: "Mono Lake Food Web" (Online Activity)

Investigation 3, Part 3, pp. 276-281
DR: "Ecoscenarios" (Online Activity), "Organism Database" (Online Resource)

Crosscutting Concepts

Energy and Matter
The transfer of energy can be tracked as energy flows through a natural system.

Populations and Ecosystems
TE: Investigation 3, Part 2, pp. 263-271
DR: "Mono Lake Food Web" (Online Activity)

Investigation 3, Part 3, pp. 276-281
DR: "Ecoscenarios" (Online Activity), "Organism Database" (Online Resource)

Investigation 5, Part 1, pp. 359-367

Investigation 5, Part 2, pp.371-382
SE: *Energy and Life,* pp. 51-55, *Where Does Food Come From?* Pp. 56-61

Investigation 5, Part 4, pp. 394-402

Investigation 6, Part 1, pp. 424-429

Investigation 6, Part 2, pp. 434-445
SE: *Rachel Carson and the Silent Spring,* pp. 70-74

Investigation 6, Part 3, pp. 451-459
SE: *Trophic Levels,* pp. 73-82

Investigation 6, Part 4, pp. 472-477

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

SE: *Rachel Carson and the Silent Spring,* pp. 70-74 Investigation 6, Part 3, pp. 451-459 **SE:** *Trophic Levels,* pp. 73-82	Investigation 5, Part 1, pp. 359-367 Investigation 5, Part 2, pp.371-382 **SE:** *Energy and Life,* pp. 51-55, *Where Does Food Come From?* Pp. 56-61 Investigation 5, Part 4, pp. 394-402 Investigation 6, Part 1, pp. 424-429 Investigation 6, Part 2, pp. 434-445 **SE:** *Rachel Carson and the Silent Spring,* pp. 70-74 Investigation 6, Part 3, pp. 451-469 **SE:** *Trophic Levels,* pp. 73-82 Investigation 6, Part 4, pp. 472-477 **SE:** *Decomposers,* pp.83-86	**SE:** *Decomposers,* pp.83-86

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Asking Questions and Defining Problems
Analyzing and Interpreting Data
Planning and Carrying Out Investigations
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Stability and Change
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity

GRADE 7

Ecosystems: Interactions, Energy, and Dynamics

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-LS2-4

Students who demonstrate understanding can:
Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

***Clarification Statement**: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems. Disruptions to any physical or biological component of an ecosystem can lead to shifts in its populations.*

Populations and Ecosystems
TE: Investigation 7, Part 1: notebook entry
Investigation 7, Part 2: performance assessment
Investigation 7, Part 3: notebook entry
Investigation 8, Part 1: notebook entry
Investigation 8, Part 2: performance assessment
Investigation 8, Part 3: notebook entry; Investigation 8 I-Check
Investigation 9, Part 1: performance assessment
Investigation 9, Part 2: performance assessment
Investigation 9, Part 3: performance assessment

Science and Engineering Practices

Engaging in Argument from Evidence
Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or model for a phenomenon or a solution to a problem.

Populations and Ecosystems
TE: Investigation 7, Part 2, pp. 512-527
SE: *Limiting Factors,* pp. 87-96

Investigation 8, Part 2, pp. 585-590
DR: Hawaii: Strangers in Paradise (Video)

Investigation 9, Part 2, pp. 633-637
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 3, pp. 641-649

Disciplinary Core Ideas

LS2.C: Ecosystems Dynamics, Functioning, and Resilience
Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.

Populations and Ecosystems
TE: Investigation 7, Part 2, pp. 512-527
SE: *Limiting Factors,* pp. 87-96

Investigation 7, Part 3, pp. 530-544
SE: *Mono Lake Data,* pp. 141-144; *Mono Lake throughout the Year,* pp. 97-99

Investigation 8, Part 1, pp. 565-582
SE: *Biodiversity,* pp. 100-107

Investigation 8, Part 2, pp. 585-590
DR: Hawaii: Strangers in Paradise (Video)

Investigation 8, Part 3, pp. 593-605
SE: *Mono Lake in the Spotlight,* pp . 118-122
DR: The Mono Lake Story (Video)

Investigation 9, Part 1, pp. 623-629
SE: *Ecoscenario Introductions,* pp.
DR: "Ecoscenario Research Center" (Online Resource)

Crosscutting Concepts

Stability and Change
Small changes in one part of a system might cause large changes in another part.

Populations and Ecosystems
TE: Investigation 7, Part 1, pp. 497-508
SE: *Milkweed Bugs,* pp. 7-12, *Milkweed-Bug Hatching Investigation,* pp. 133-135

Investigation 7, Part 2, pp. 512-527
SE: *Limiting Factors,* pp. 87-96

Investigation 7, Part 3, pp. 530-544
SE: *Mono Lake Data,* pp. 141-144; *Mono Lake throughout the Year,* pp. 97-99

Investigation 8, Part 1, pp. 565-582
SE: *Biodiversity,* pp. 100-107

Investigation 8, Part 2, pp. 585-590
DR: Hawaii: Strangers in Paradise (Video)

Investigation 8, Part 3, pp. 593-605
SE: *Mono Lake in the Spotlight,* pp. 118-122
DR: The Mono Lake Story (Video)

Investigation 9, Part 2, pp. 633-637
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 3, pp. 641-649

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

	Investigation 9, Part 2, pp. 633-637 **DR:** "Ecoscenario Research Center" (Online Resource) Investigation 9, Part 3, pp. 641-649	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity

GRADE 7

Ecosystems: Interactions, Energy, and Dynamics

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-LS2-5

Students who demonstrate understanding can:
Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

***Clarification Statement**: Humans can benefit from services that are provided by healthy ecosystems. These ecosystem services could include climate stabilization, water purification, nutrient recycling, pollination, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.*

Populations and Ecosystems
TE: Investigation 8, Part 1: notebook entry
Investigation 8, Part 2: performance assessment
Investigation 8, Part 3: notebook entry; Investigation 8 I-Check
Investigation 9, Part 1: performance assessment
Investigation 9, Part 2: performance assessment
Investigation 9, Part 3: performance assessment

Science and Engineering Practices

Engaging in Argument from Evidence
Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

Populations and Ecosystems
TE: Investigation 8, Part 2, pp. 585-590
DR: Hawaii: Strangers in Paradise (Video)

Investigation 8, Part 3, pp. 593-605
SE: *Mono Lake in the Spotlight,* pp
DR: The Mono Lake Story (Video)

Investigation 9, Part 2, pp. 633-637
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 3, pp. 641-649

Disciplinary Core Ideas

LS2.C: Ecosystem Dynamics, Functioning, and Resilience
Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.

LS4.D: Biodiversity and Humans
Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.

Populations and Ecosystems
TE: Investigation 8, Part 1, pp. 565-582
SE: *Biodiversity,* pp. 100-107

Investigation 8, Part 2, pp. 585-590
SE: *Invasive Species,* pp. 108-117
DR: Hawaii: Strangers in Paradise (Video)

Investigation 8, Part 3, pp. 593-605
SE: *Mono Lake in the Spotlight,* pp. 118-122
DR: The Mono Lake Story (Video)

Investigation 9, Part 1, pp. 623-629
SE: *Ecoscenario Introductions,* pp. 16-30
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 2, pp. 633-637
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 3, pp. 641-649

Crosscutting Concepts

Stability and Change
Small changes in one part of a system might cause large changes in another part.

Populations and Ecosystems
TE: Investigation 8, Part 1, pp. 565-582
SE: *Biodiversity,* pp. 100-107

Investigation 8, Part 2, pp. 585-590
SE: *Invasive Species,* pp. 108-117
DR: Hawaii: Strangers in Paradise (Video)

Investigation 8, Part 3, pp. 593-605
SE: *Mono Lake in the Spotlight,* pp. 118-122
DR: The Mono Lake Story (Video)

Investigation 9, Part 2, pp. 633-637
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 3, pp. 641-649

	ETS1.B: Developing Possible Solutions There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. **ETS2.B: Influence of Science, Engineering, and Technology on Society and the Natural World** The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. ***Variables and Design*** **TE:** Investigation 2, Part 2: Engineering Design Investigation 3, Part 1: Defining a Problem Investigation 3, Part 2: Future Tech	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Planning and Carrying Out Investigations	
Asking Questions and Defining Problems	
Analyzing and Interpreting Data	
Constructing Explanations and Designing Solutions	
Obtaining, Evaluating, and Communicating Information	x

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

- Patterns
- Cause and Effect
- Systems and System Models
- Scale, Proportion, and Quantity
- Structure and Function

GRADE 7

Earth and Human Activity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-ESS3-1

Students who demonstrate understanding can:
Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

***Clarification Statement**: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).*

Earth History (FOSSweb Digital)
TE: Investigation 8, Geoscenarios: performance assessment

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evide4nce consistent with scientific ideas, principles, and theories.

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Earth History (FOSSweb Digital)
TE: Investigation 8, Parts 1 and 2
DR: "Geoscenarios" (Online resource)

Disciplinary Core Ideas

ESS3.A: Natural Resources
Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World
All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

Earth History (FOSSweb Digital)
TE: Investigation 8, Parts 1 and 2
DR: "Geoscenarios" (Online resource)

Variables and Design
TE: Investigation 3, Real World Problems

Crosscutting Concepts

Cause and Effect
Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.

Earth History (FOSSweb Digital)
TE: Investigation 8, Parts 1 and 2
DR: "Geoscenarios" (Online resource)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Obtaining, Evaluating, and Communicating Information x

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 7

Earth and Human Activity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-ESS3-3

Students who demonstrate understanding can:
Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.

Clarification Statement: *Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).*

Populations and Ecosystems
TE: Investigation 8 I-Check
Investigation 9, Part 1: performance assessment
Investigation 9, Part 2: performance assessment
Investigation 9, Part 3: performance assessment

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Apply scientific principles to design an object, tool, process, or system.

Populations and Ecosystems
TE: Investigation 9, Part 1, pp. 623-629
SE: *Ecoscenario Introductions,* pp. 16-30
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 2, pp. 633-637
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 3, pp. 641-649

Disciplinary Core Ideas

ESS3.C: Human Impacts on Earth Systems
Human activities have significantly altered the biosphere, sometimes damaging, or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things

Typically, as human populations and per capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

Populations and Ecosystems
TE: Investigation 9, Part 1, pp. 623-629
SE: *Ecoscenario Introductions,* pp. 16-30
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 2, pp. 633-637
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 3, pp. 641-649

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World
All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

The uses of technologies and any limitations on their use and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural

Crosscutting Concepts

Cause and Effect
Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.

Populations and Ecosystems
TE: Investigation 9, Part 1, pp. 623-629
SE: *Ecoscenario Introductions,* pp. `6-30
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 2, pp. 633-637
DR: "Ecoscenario Research Center" (Online Resource)

Investigation 9, Part 3, pp. 641-649

	resources, and economic conditions. Thus, technology use varies from region to region and over time. ***Variables and Design*** **TE:** Investigation 3, Part 1: Define a Problem Investigation 3, Part 2: Future Tech	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Stability and Change
Systems and System Models

GRADE 7

Earth and Human Activity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-ESS3-4

Students who demonstrate understanding can:
Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

***Clarification Statement**: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.*

Populations and Ecosystems
TE: Investigation 8, Part 1: notebook entry, I-Check

Science and Engineering Practices

Engaging in Argument from Evidence
Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or model for a phenomenon or a solution to a problem.

Populations and Ecosystems
TE: Investigation 8, Part 1, pp. 573-582
SE: *Biodiversity,* pp. 100-107

Disciplinary Core Ideas

ESS3.C: Human Impacts on Earth Systems
Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World
All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

Populations and Ecosystems
TE: Investigation 8, Part 1, pp. 573-582
SE: *Biodiversity,* pp. 100-107

Crosscutting Concepts

Cause and Effect
Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.

Populations and Ecosystems
TE: Investigation 8, Part 1, pp. 573-582
SE: *Biodiversity,* pp. 100-107

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Stability and Change
Systems and System Models
Scale, Proportion, and Quantity

GRADE 7

Earth and Human Activity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 7-ESS3-5

Students who demonstrate understanding can:
Ask questions to clarify evidence of the factors that have impacted global temperatures over the past century.

***Clarification Statement**: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures; atmospheric levels of gases such as carbon dioxide and methane; and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.*

Populations and Ecosystems
TE: Investigation 7, Part 4: performance assessment
Investigation 9, Part 1: performance assessment

Earth History (FOSSweb Digital)
TE: Investigation 8, Geoscenarios: performance assessment

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in grades 6-8 builds on grades K-5 experiences and progresses to specifying relationships between variables and clarifying arguments and models.

Ask questions to identify and clarify evidence of an argument.

Populations and Ecosystems
TE: Investigation 7, Part 2, pp. 512-527
SE: *Limiting Factors,* pp. 87-96

Investigation 8, Part 1, pp. 573-582
SE: *Biodiversity,* pp. 100-582

Investigation 9, Part 1, pp. 623-629
SE: *Ecoscenario Introductions,* pp. 16-30
DR: "Ecoscenario Research Center" (Online Activity)

Basics (Video)

Earth History (FOSSweb Digital)
TE: Investigation 8, Part 2, pp. 620-625
Investigation 8, Part 3, pp. 629-633

DR: "Geoscenarios" (Online Resource)

Disciplinary Core Ideas

ESS3.D: Global Climate Change
Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature. Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World
All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time.

Populations and Ecosystems
TE: Investigation 7, Part 2, pp. 512-527
SE: *Limiting Factors,* pp. 87-96

Investigation 8, Part 1, pp. 573-582
SE: *Biodiversity,* pp. 100-582

Crosscutting Concepts

Stability and Change
Stability might be disturbed either by sudden events or gradual changes that accumulate over time.

Populations and Ecosystems
TE: Investigation 7, Part 2, pp. 512-527
SE: *Limiting Factors,* pp. 87-96

Investigation 8, Part 1, pp. 573-582
SE: *Biodiversity,* pp. 100-582

Investigation 9, Part 1, pp. 623-629
SE: *Ecoscenario Introductions,* pp. 16-30
DR: "Ecoscenario Research Center" (Online Activity)

Earth History (FOSSweb Digital)
TE: Investigation 8, Part 2, pp. 620-625
SE: Same as Investigation 8, Part 1
DR: "Geoscenarios" (Online Resource)

Investigation 8, Part 3, pp. 629-633

.	Investigation 9, Part 1, pp. 623-629 **SE**: *Ecoscenario Introductions,* pp. 16-30 **DR:** "Ecoscenario Research Center" (Online Activity) ***Earth History (FOSSweb Digital)*** **TE:** Investigation 8, Part 1, pp. 612-617 **SE:** *Geoscenario Introduction: Glaciers,* pp. 99-103; *Geoscenario Introduction: Coal,* pp. 104-108; *Geoscenario Introduction: Yellowstone Hotspot,* pp. 109-113; *Geoscenario Introduction: Oil,* pp. 114-118 **DR:** "Geoscenarios" (Online Resource) Investigation 8, Part 2, pp. 620-625 **SE:** Same as Investigation 8, Part 1 **DR:** "Geoscenarios" (Online Resource) "Timeliner" (Online Activity), "Rock Column Movie Maker" (Online Activity) Investigation 8, Part 3, pp. 629-633	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity

GRADE 8

Motion and Stability: Forces and Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-PS2-1

Students who demonstrate understanding can:
Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects in a system.*

***Clarification Statement**: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.*
***Assessment Boundary**: Assessment is limited to vertical or horizontal interactions in one dimension.*

Gravity and Kinetic Energy (FOSSweb Digital)
TE: Investigation 3, Performance Assessment

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Apply scientific principles to design an object, tool, process, or system.

Gravity and Kinetic Energy (FOSSweb Digital)
TE: Investigation 4, Part 1, pp. 271-287
SE: *Engineering a Safer Car,* pp. 50-56; *Collisions and Concussions,* pp. 57-62
DR: Understanding Car Crashes (Video)

Disciplinary Core Ideas

PS2.A: Forces and Motion
For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law).

ETS1.B: Developing Possible Solutions
A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World
The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.

Electromagnetic Forces
TE: Investigation 1, Part 1, pp. 86-90
DR: Forces (video)
Chapter 4 (Newtons Laws)
Chapter 8 (Forces Conclusion)

Gravity and Kinetic Energy (FOSSweb Digital)
TE: Investigation 3, Part 1, pp. 213-229
SE: *Potential and Kinetic Energy,* pp. 37-40

Investigation 3, Part 2, pp.
SE: *Avoiding Collisions,* pp. 41-44

Investigation 3, Part 3,
SE: *Newton's Laws,* pp. 45-49

Crosscutting Concepts

Systems and System Models
Models can be used to represent systems and their interactions - such as inputs, processes, and outputs - and energy and matter flows within systems.

Gravity and Kinetic Energy (FOSSweb Digital)
SE: *Potential and Kinetic Energy,* pp. 37-40

Investigation 4, Part 1, pp. 271-287
SE: *Engineering a Safer Car,* pp. 50-56; *Collisions and Concussions,* pp. 57-62
DR: Understanding Car Crashes (Video)

	Investigation 4, Part 1, pp. 271-287 **SE:** *Engineering a Safer Car,* pp. 50-56; *Collisions and Concussions,* pp. 57-62 **DR:** Understanding Car Crashes (Video)	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Stability and Change
Cause and Effect
Scale, Proportion, and Quantity
Structure and Function

GRADE 8

Motion and Stability: Forces and Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-PS2-2

Students who demonstrate understanding can:
Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

***Clarification Statement**: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference; and specification of units.*
***Assessment Boundary**: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.*

Electromagnetic Force
TE: Investigation 1, Part 1: notebook entry
Investigation 1, Part 2: performance assessment
Investigation 1, Part 3: response sheet

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying investigations to answer questions or test solutions to problems in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.

Electromagnetic Force
TE: Investigation 1, Part 2, pp. 112-117
SE: *The Discovery of Friction,* pp. 8-14

SE: *Gravity in Space,* pp. 31-36

Investigation 3, Part 1, pp. 215-223

Investigation 3, Part 2, pp. 230-241

Investigation 3, Part 3, pp. 243-255
SE: *Engineering Design Process,* p. 68; *Electromagnetic Engineering,* pp.42-46
DR: "Virtual Magnet" (Online Activity)

Disciplinary Core Ideas

PS2.A: Forces and Motion
The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change (inertia). The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.

The positions of objects and the directions of forces and motions must be described using a qualitative comparison and scalar quantities. In order to share information with other people, a reference frame must also be shared.

Electromagnetic Force
TE: Investigation 1, Part 1, pp. 97-108
SE: *The Force is with You,* pp. 2-7

Investigation 1, Part 2, pp. 112-117
SE: *The Discovery of Friction,* pp. 8-14

Investigation 1, Part 3, pp. 121-134
SE: *Net Force,* pp. 15-18
DR: Forces (Video)

Investigation 3, Part 2, pp. 230-241
SE: *Electromagnetism,* pp. 38-41

Investigation 3, Part 3, pp. 243-255
SE: *Engineering Design Process,* p. 68; *Electromagnetic Engineering,* pp.42-46
DR: "Virtual Magnet" (Online Activity)

Crosscutting Concepts

Stability and Change
Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales.

Electromagnetic Force
TE: Investigation 1, Part 3, pp. 121-134
SE: *Net Force,* pp. 15-18
DR: Forces (Video)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 8

Motion and Stability: Forces and Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-PS2-3

Students who demonstrate understanding can:
Analyze and interpret data to determine the factors that affect the strength of electric and magnetic forces.

***Clarification Statement**: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.*
***Assessment Boundary**: Assessment is limited to data examples using proportional reasoning and algebraic thinking, rather than mathematicalk computations.*

Electromagnetic Force
TE: Investigation 2, Part 3: Investigation 2 I-Check
Investigation 3, Part 2: notebook entry
Investigation 3, Part 3: performance assessment; Investigation 3 I-Check
Investigation 4, Part 1: notebook entry
Investigation 4, Part 2: performance assessment

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basis statistical techniques of data and error analysis

Analyze displays of data to identify linear and nonlinear relationships.

Electromagnetic Force
TE: Investigation 3, Part 2, pp. 230-241
SE: *Electromagnetism,* pp. 38-41

Investigation 3, Part 3, pp. 243-255
SE: *Engineering Design Process,* p. 68; *Electromagnetic Engineering,* pp.42-46
DR: "Virtual Magnet" (Online Activity)

Investigation 4, Part 1, pp. 273-280
SE: *Motor Dissection A,* p. 69; *Motor Dissection B,* p. 70

Investigation 4, Part 2, pp. 287-302
SE: *Where We Get Energy",* pp.56-62; *The Rebirth of Electric Cars,* pp. 47-55; *Generator Dissection,* p. 72
DR: Generator Dissection (Video)

Disciplinary Core Ideas

PS2.B: Types of Interactions
Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.

Electromagnetic Force
TE: Investigation 2, Part 3
Investigation 3, Part 2: notebook entry
Investigation 3, Part 3: performance assessment
Investigation 3 I-Check
Investigation 4, Part 1: notebook entry
Investigation 4, Part 2: performance assessment

Crosscutting Concepts

Cause and Effect
Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.

Electromagnetic Force
TE: Investigation 3, Part 3, pp. 243-255
SE: *Engineering Design Process,* p. 68; *Electromagnetic Engineering,* pp.42-46
DR: "Virtual Magnet" (Online Activity)

Investigation 4, Part 2, pp. 287-302
SE: *Where We Get Energy",* pp. 56-62; *The Rebirth of Electric Cars,* pp. 47-55; *Generator Dissection,* p. 72
DR: Generator Dissection (Video)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Energy and Matter
Stability and Change
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 8

Motion and Stability: Forces and Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-PS2-4

Students who demonstrate understanding can:
Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects and the distance between them. .

***Clarification Statement**: Examples of evidence for arguments could include data generated from simulations or digital tools, and charts displaying mass, strength of interaction, distance between objects, and orbital periods of objects within the solar system.*
***Assessment Boundary**: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.*

Planetary Science
TE: Investigation 6, Part 2: performance assessment

Gravity and Kinetic Energy (FOSSweb Digital)
TE: Investigation 1, I-Check
TE: Investigation 2, I-Check

Science and Engineering Practices

Engaging in Argument from Evidence
Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Construct and present oral and written arguments supported by empirical evidence to support or refute an explanation or a model for a phenomenon or a solution to a problem.

Gravity and Kinetic Energy (FOSSweb Digital)
TE: Investigation 1, Part 3, pp. 126-147
SE: *Gravity: It's the Law,* pp. 18-25
DR: Falling Ball (Video), Hammer and Feather in Space (Video), "Movie Tracker" (Online Activity), "Movie Tracker Data" (Online Activity), "Falling Ball Analysis" (Online Slide Show)

Investigation 2, Part 2, pp. 178-195
SE: *Gravity in Space,* pp. 31-36

Planetary Science
TE: Investigation 6, Part 2, pp. 404-422
SE: *How the Earth Got and Held onto Its Moon,* pp. : *Sun, Planets, and Satellites In the Solar System,* p. 135
DR: "Solar System Origin Card Sort" (Online Activity), "Origin of the Moon" (Online Activity), Tides (Online Activity)

Disciplinary Core Ideas

PS2.B: Types of Interactions
The magnitude of the gravitational force depends on the masses and distances between interacting objects. Long-range gravitational interactions govern the evolution and maintenance of large-scale structures in the universe and the patterns of motion within them.

Gravity and Kinetic Energy (FOSSweb Digital)
TE: Investigation 1, Part 3, pp. 126-147
SE: *Gravity: It's the Law,* pp. 18-25
DR: Falling Ball (Video), Hammer and Feather in Space (Video), "Movie Tracker" (Online Activity), "Movie Tracker Data" (Online Activity), "Falling Ball Analysis" (Online Slide Show)

Investigation 2, Part 2, pp. 178-195
SE: *Gravity in Space,* pp. 31-36

Planetary Science
TE: Investigation 6, Part 2, pp. 404-422
SE: *How the Earth Got and Held onto Its Moon,* pp. : *Sun, Planets, and Satellites In the Solar System,* p. 135
DR: "Solar System Origin Card Sort" (Online Activity), "Origin of the Moon" (Online Activity), Tides (Online Activity)

Crosscutting Concepts

Systems and System Models
Models can be used to represent systems and their interactions - such as inputs, processes and outputs - and energy and matter flows within systems.

Gravity and Kinetic Energy (FOSSweb Digital)
TE: Investigation 1, Part 3, pp. 126-147
SE: *Gravity: It's the Law,* pp. 18-25
DR: Falling Ball (Video), Hammer and Feather in Space (Video), "Movie Tracker" (Online Activity), "Movie Tracker Data" (Online Activity), "Falling Ball Analysis" (Online Slide Show)

Investigation 2, Part 2, pp. 178-195
SE: *Gravity in Space,* pp. 31-36

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Stability and Change
Energy and Matter
Cause and Effect
Scale, Proportion, and Quantity
Structure and Function

GRADE 8

Motion and Stability: Forces and Interactions

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-PS2-5

Students who demonstrate understanding can:
Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

***Clarification Statement**: Examples of this phenomenon could include the interactions of magnets and electrically charged objects. Examples of investigations could include first-hand experiences or simulations.*
***Assessment Boundary**: Assessment is limited to electric and magnetic fields and limited to qualitative evidence for the existence of fields.*

Electromagnetic Force
TE: Investigation 2, Part 2: response sheet
Investigation 2, Part 3: performance assessment
Investigation 2: I-Check

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying investigations to answer questions or test solutions to problems in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation.

Electromagnetic Forces
TE: Investigation 2, Part 2, pp. 163-177
SE: *Magnetic Force,* pp. 19-24
DR: Magnetism (Video)

Investigation 2, Part 3, pp. 180-190
DR: "Adding Magnetic Fields" (Online Activity)

Disciplinary Core Ideas

PS2.B: Types of Interactions
Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be illustrated by their effect on a test object (a charged object, or a ball, respectively).

Electromagnetic Forces
TE: Investigation 2, Part 2, pp. 163-177
SE: *Magnetic Force,* pp. 19-24
DR: Magnetism (Video)

Investigation 2, Part 3, pp. 180-190
DR: "Adding Magnetic Fields" (Online Activity)

Crosscutting Concepts

Cause and Effect
Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.

Electromagnetic Forces
TE: Investigation 2, Part 2, pp. 163-177
SE: *Magnetic Force,* pp. 19-24
DR: Magnetism (Video)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Developing and Using Models
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Energy and Matter
Systems and System Models
Scale, Proportion, and Quantity

GRADE 8

Waves and Their Applications in Technologies for Information Transfer

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-PS4-1

Students who demonstrate understanding can:
Using mathematical representations, describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

***Clarification Statement**: Emphasis is on describing waves with both qualitative and quantitative thinking.*
***Assessment Boundary**: Assessment does not include electromagnetic waves and is limited to standard repeating waves. Assessment does not include relationships between the speed of waves and their frequency or wavelength.*

Waves
TE: Investigation 1, Part 1: notebook entry
Investigation 1, Part 2: performance assessment
Investigation 2, Part 1: notebook entry
Investigation 2, Part 3: performance assessment; Investigation 1-2 I-Check

Science and Engineering Practices

Using Mathematical and Computational Thinking
Mathematical and computational thinking at the 6-8 level builds on K-5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

Use mathematical representation to describe and/or support scientific conclusions and design solutions.

Waves
TE: Investigation 1, Part 1, pp.93-98

Investigation 1, Part 2, pp. 102-111
SE: *Transverse and Compression Waves,* p. 81
DR: Standing Wave (Video), "Metronome" (Online Activity)

Disciplinary Core Ideas

PS4.A: Wave Properties
A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.

Waves
TE: Investigation 1, Part 1, pp.93-98

Investigation 1, Part 2, pp. 102-111
SE: *Transverse and Compression Waves,* p. 81
DR: Standing Wave (Video), "Metronome" (Online Activity)

Investigation 2, Part 1, pp. 129-140
SE: *Ocean Waves,* pp. 3-6; *Tsunamis!* Pp. 7-11
DR: Big Waves (Video)

Investigation 2, Part 3, pp. 161-163; p. 166, pp. 168-172
SE: *Sound Waves,* pp. 17-20
DR: "Oscilloscope" (Online Activity)

Crosscutting Concepts

Patterns
Graphs and charts can be used to identify patterns in data.

Waves
TE: Investigation 1, Part 1, pp.93-98

Investigation 1, Part 2, pp. 102-111
SE: *Transverse and Compression Waves,* p. 81
DR: Standing Wave (Video), "Metronome" (Online Activity)

Investigation 2, Part 1, pp. 129-140
SE: *Ocean Waves,* pp. 3-6; *Tsunamis!* Pp. 7-11
DR: Big Waves (Video)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed
Developing and Using Models
Planning and Carrying Out Investigations
Analyzing and Interpreting Data

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Energy and Matter
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity
Structure and Function

GRADE 8

Waves and Their Applications in Technologies for Information Transfer

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-PS4-3

Students who demonstrate understanding can:
Communicate information to support the claim that digital devices are used to improve our understanding of how waves transmit information.

***Clarification Statement**: Emphasis is on a basic understanding that waves can be used for communication purposes and digitized signals are a more reliable way to encode and transmit information than analog. When in digitized form, information can be recorded, stored for future recovery, and transmitted over long distances without significant degradation. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in WIFI devices, and conversion of stored binary patterns to make sound or text on a computer screen.*
***Assessment Boundary**: Assessment does not include binary counting nor the specific mechanism of any given device.*

Waves
TE: Investigation 4, Part 1: notebook entry
Investigation 4, Part 2: notebook entry
Investigation 4, Part 3: notebook entry; Investigation 4 I-Check

Science and Engineering Practices

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluation, and communicating in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods.

Integrate qualitative scientific and technical information in different forms of text that are contained in media and visual displays to clarify claims and findings.

Waves
TE: Investigation 4, Part 1, pp. 262-266
SE: *Lasers,* pp. 58-62
DR: Fiber Optics (Video)

Investigation 4, Part 2, pp. 269-276
SE: *Amplitude and Frequency Modulation,* p. 86

Investigation 4, Part 3, pp. 279-295
SE: *Digital Communication,* pp. 63-68; *Telecommunication: From Telegraph to Smartphone,* pp. 69-78
DR: *Digitized Images* (Online Activity)

Disciplinary Core Ideas

PS4.C: Information Technologies and Instrumentation
Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.

ETS2.B: Influence of Science, Engineering, and Technology on Society and the Natural World
Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.

Waves
TE: Investigation 4, Part 1, pp. 262-266
SE: *Lasers,* pp. 58-62
DR: Fiber Optics (Video)

Investigation 4, Part 2, pp. 269-276
SE: *Amplitude and Frequency Modulation,* p. 86

Investigation 4, Part 3, pp. 279-295
SE: *Digital Communication,* pp. 63-68; *Telecommunication: From Telegraph to Smartphone,* pp. 69-78
DR: *Digitized Images* (Online Activity)

Crosscutting Concepts

Structure and Function
Structures can be designed to serve particular functions.

Waves
TE: Investigation 4, Part 1, pp. 262-266
SE: *Lasers,* pp. 58-62
DR: Fiber Optics (Video)

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Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed
Developing and Using Models

Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Using Mathematical and Computational Thinking

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Scale, Proportion, and Quantity

GRADE 8

From Molecules to Organisms: Structures and Processes

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-LS1-4

Students who demonstrate understanding can:

Use arguments, based on empirical evidence and scientific reasoning, to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

***Clarification Statement**: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.*

Diversity of Life Module (FOSSweb Digital)
TE: Investigation 6, Part 1: notebook entry
Investigation 6, Part 2: performance assessment
Investigation 6, Part 3: response sheet
Investigation 6, Part 4: notebook entry; Investigation 6 I-Check
Investigation 8, Part 1: performance assessment

Science and Engineering Practices

Engaging in Argument from Evidence
Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for phenomena or a solution to a probl.

Diversity of Life (FOSSweb Digital)
TE: Investigation 6, Part 2, pp. 467-474
SE: *Breeding Salt-Tolerant Wheat*

Investigation 6, Part 3, pp. 479-489
SE: *The Making of a New Plant,* pp. 62-64; *Seeds on the Move,* pp. 65-72
DR: "Nonflowering-Plant Reproduction (Online Slides), "Database: Seed Collection" (Online Resource)

Investigation 6, Part 4, pp. 495-498
SE: *Flower Information,* pp. 122-125; *Flowers and Pollinators,* pp. 126-133

Investigation 8, Part 1, pp. 572-578, 582
SE: *Those Amazing Insects,* pp. 81-89; *Insect Structures and Functions,* pp. 134-142
DR: "Database: Insect Collection" (Online Resource)

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms
Animals engage in characteristic behaviors that increase the odds of reproduction.

Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

Diversity of Life (FOSSweb Digital)

TE: Investigation 6, Part 1, pp. 456-459

Investigation 6, Part 2, pp. 467-474
SE: *Breeding Salt-Tolerant Wheat*

Investigation 6, Part 3, pp. 479-489
SE: *The Making of a New Plant,* pp. 62-64; *Seeds on the Move,* pp. 65-72
DR: "Nonflowering-Plant Reproduction (Online Slides), "Database: Seed Collection" (Online Resource)

Investigation 6, Part 4, pp. 495-500
SE: *Flower Information,* pp. 122-125; *Flowers and Pollinators,* pp. 126-133
DR: "Database: Pollinator Collector" (Online Activity), "Pollinators Game" (Online Activity)

Investigation 8, Part 1, pp. 572-582
SE: *Those Amazing Insects,* pp. 81-89, *Insect Structures and Functions,* pp. 134-142
DR: "Database: Insect Collection" (Online Resource)

Crosscutting Concepts

Cause and Effect
Phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.

Diversity of Life (FOSSweb Digital)

TE: Investigation 6, Part 2, pp. 467-474
SE: *Breeding Salt-Tolerant Wheat*

Investigation 6, Part 4, pp. 495-500
SE: *Flower Information,* pp. 122-125; *Flowers and Pollinators,* pp. 126-133
DR: "Database: Pollinator Collector" (Online Activity), "Pollinators Game" (Online Activity)

Investigation 8, Part 1, pp. 572-582
SE: *Those Amazing Insects,* pp. 81-89; *Insect Structures and Functions,* pp. 134-142
DR: "Database: Insect Collection" (Online Resource)

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Systems and System Models
Structure and Function

GRADE 8

From Molecules to Organisms: Structures and Processes

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-LS1-5

Students who demonstrate understanding can:
Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

***Clarification Statement**: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include how drought or flooding affects plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.*
***Assessment Boundary**: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.*

Diversity of Life (FOSSweb Digital)
TE: Investigation 6, Part 2: performance assessment
Investigation 6, Part 3: response sheet
Investigation 6, Part 4: notebook entry; Investigation 6 I-Check

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Diversity of Life (FOSSweb Digital)
TE: Investigation 6, Part 2, pp. 467-474
SE: *Breeding Salt-Tolerant Wheat*

Investigation 6, Part 3, pp. 479-489
SE: *The Making of a New Plant,* pp. 62-64; *Seeds on the Move,* pp. 65-72
DR: "Nonflowering-Plant Reproduction (Online Slides)

Investigation 6, Part 4, pp. 495-500
SE: *Flower Information,* pp. 122-125; *Flowers and Pollinators,* pp. 126-133
DR: "Database: Pollinator Collector" (Online Activity), "Pollinators Game" (Online Activity)

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms
Genetic factors as well as local conditions affect the growth of the adult plant. The growth of an animal is controlled by genetic factors, food intake, and interactions with other organisms, and each species has a typical adult size range.

Diversity of Life (FOSSweb Digital)
TE: Investigation 6, Part 2, pp. 467-474
SE: *Breeding Salt-Tolerant Wheat*

Investigation 6, Part 3, pp. 479-489
SE: *The Making of a New Plant,* pp. 62-64;
Seeds on the Move, pp. 65-72
DR: "Nonflowering-Plant Reproduction (Online Slides)

Investigation 6, Part 4, pp. 495-500
SE: *Flower Information,* pp. 122-125;
Flowers and Pollinators, pp. 126-133
DR: "Database: Pollinator Collector" (Online Activity), "Pollinators Game" (Online Activity)

Crosscutting Concepts

Cause and Effect
Phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.

Diversity of Life (FOSSweb Digital)
TE: Investigation 6, Part 2, pp. 467-473
SE: *Breeding Salt-Tolerant Wheat*

Investigation 6, Part 3, pp. 479-489
SE: *Seeds on the Move,* pp. 65-72

Investigation 6, Part 4, pp. 495-500
SE: *Flowers and Pollinators,* pp. 126-133

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Asking Questions and Defining Problems
Analyzing and Interpreting Data
Engaging in Argument from Evidence
Planning and Carrying Out Investigations
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns
Structure and Function

GRADE 8

Heredity: Inheritance and Variation of Traits

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-LS3-1

Students who demonstrate understanding can:
Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

Clarification Statement: *Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.*
Assessment Boundary*: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.*

Heredity and Adaptation
TE: Investigation 3, Part 1: notebook entry, Investigation 1 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe phenomena.

Heredity and Adaptation
TE: Investigation 3, Part 1, pp. 250-272
SE: *Adaptation,* pp. 41-52
DR: *"Walking Sticks: Eat Insects"* (Online Activity),

Disciplinary Core Ideas

LS3.A: Inheritance of Traits
Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual.

Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.

LS3.B: Variation of Traits
In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations.

Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.

Heredity and Adaptation
TE: Investigation 3, Part 1, pp. 250-272
SE: *Adaptation,* pp. 41-52
DR: *"Walking Sticks: Eat Insects"* (Online Activity)

Crosscutting Concepts

Structure and Function
Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore complex natural structures/systems can be analyzed to determine how they function.

Heredity and Adaptation
TE: Investigation 3, Part 1, pp. 250-256
DR: *"Walking Sticks: Eat Insects"* (Online Activity)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigation Listed
Analyzing and Interpreting Data
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigation Listed
Patterns
Stability and Change
Cause and Effect

GRADE 8

Heredity: Inheritance and Variation of Traits

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-LS3-2

Students who demonstrate understanding can:
Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

***Clarification Statement**: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause-and-effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.*
***Assessment Boundary**: Assessment should be limited to Punnett squares of monohybrid cross.*

Heredity and Adaptation
TE: Investigation 2, Part 2: notebook entry
Investigation 2, Part 3: response sheet
Investigation 2, Part 4: notebook entry, Investigation 2 I-Check

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe phenomena.

Heredity and Adaptation
TE: Investigation 2, Part 2, pp. 180-199
SE: *Understanding Heredity,* pp. 22-27; *A Larkey Yammer,* pp. 82-83
DR: "Heredity" (Online Slideshow)

Investigation 2, Part 3, pp. 203-208
DR: "A Model for Predicting Genetic Variation" (Online Activity) "Larkey Impossible Traits (Online Activity)

Investigation 2, Part 4, pp. 212-230
SE: *Mendel and Punnett Squares,* pp. 28-35 *Mapping the Human Genome,* pp. 36-40
DR: "A Model for Predicting Genetic Variation" (Online Activity), "Larkey Punnett Squares" (Online Activity)

Diversity of Life (FOSSweb Digital)
TE: Investigation 7, Part 1, pp. 521- 531
DR: *Genes and Heredity* (Video)

Investigation 7, Part 2, pp. 533-551
SE: *Mendel and Punnett Squares,* pp. 73-

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms
Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.

LS3.A: Inheritance of Traits
Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.

LS3.B: Variation of Traits
In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. In asexual reproduction, an organism's DNA is replicated and passed to its offspring creating a genetic copy of the parent.

Heredity and Adaptation
TE: Investigation 2, Part 2, pp. 180-199
SE: *Understanding Heredity,* pp. 22-27; *A Larkey Yammer,* pp. 82-83
DR: "Heredity" (Online Slideshow)

Investigation 2, Part 3, pp. 203-208
DR: "A Model for Predicting Genetic Variation" (Online Activity) "Larkey Impossible Traits (Online Activity)

Investigation 2, Part 4, pp. 212-230
SE: *Mendel and Punnett Squares,* pp.

Crosscutting Concepts

Cause and Effect
Cause-and-effect relationships may be used to predict phenomena in natural systems.

Heredity and Adaptation
TE: Investigation 2, Part 2, pp. 180-199
SE: *Understanding Heredity,* pp. 22-27; A *Larkey Yammer,* pp. 82-83
DR: "Heredity" (Online Slideshow)

Investigation 2, Part 4, pp. 212-230
SE: *Mendel and Punnett Squares,* pp. 28-35 *Mapping the Human Genome,* pp. 36-40
DR: "A Model for Predicting Genetic Variation" (Online Activity), "Larkey Punnett Squares" (Online Activity)

Diversity of Life (FOSSweb Digital)
TE: Investigation 7, Part 1, pp. 521- 531
DR: *Genes and Heredity* (Video)

Investigation 7, Part 2, pp. 533-551
SE: *Mendel and Punnett Squares,* pp. 73-80
DR: *Genes and Heredity* (Video)

80 **DR:** *Genes and Heredity* (Video)	28-35 *Mapping the Human Genome,* pp. 36-40 **DR:** "A Model for Predicting Genetic Variation" (Online Activity), "Larkey Punnett Squares" (Online Activity) ***Diversity of Life (FOSSweb Digital)*** **TE:** Investigation 7, Part 1, pp. 521- 531 **DR:** *Genes and Heredity* (Video) Investigation 7, Part 2, pp. 533-551 **SE:** *Mendel and Punnett Squares,* pp. 73-80 **DR:** *Genes and Heredity* (Video)	

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Analyzing and Interpreting Data
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Patterns

GRADE 8

Biological Evolution: Unity and Diversity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-LS4-1

Students who demonstrate understanding can:
Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operated in the past as they do today.

***Clarification Statement**: Emphasis is on finding patterns of change in the level of complexity of anatomical structures in organisms and the chronological order of fossils' appearance in the rock layers.*
***Assessment Boundary**: Assessment does not include the names of individual species or geological eras in the fossil record.*

Heredity and Adaptation
TE: Investigation 1, Part 1: quick write
Investigation 1, Part 2: notebook entry, Investigation 1 I-Check

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basis statistical techniques of data and error analysis

Analyze and interpret data to determine similarities and differences in findings.

Heredity and Adaptation
TE: Investigation 1, Part 1, pp, 92-108
SE: *Fossil Dating,* pp. 3-10, *Mass Extinctions,* pp. 73-77
DR: "Biodiversity" (Online Slideshow), "Fossils" (Online Slideshow)

Investigation 1, Part 2, pp. 114
SE: *An Interview with Jennifer Clack,* pp. 11-16; *Transitions,* pp. 78-81
DR: Fish with Fingers (Video), Great Transitions: The Origin of Tetrapods (Video)

Disciplinary Core Ideas

LS4.A: Evidence of Common Ancestry and Diversity
The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.

ESS2.E: Biogeology
Sudden changes in conditions (e.g., meteor impacts, major volcanic eruptions) have caused mass extinctions, but these changes, as well as more gradual ones, have ultimately allowed other life forms to flourish.

Heredity and Adaptation
TE: Investigation 1, Part 1, pp, 92-108
SE: *Fossil Dating,* pp 3-10, *Mass Extinctions,* pp. 73-77

DR: "Biodiversity" (Online Slideshow), "Fossils" (Online Slideshow)

Investigation 1, Part 2, pp.
SE: *An Interview with Jennifer Clack,* pp. 11-16; *Transitions,* pp. 78-81
DR: Fish with Fingers (Video), Great Transitions: The Origin of Tetrapods (Video)

Crosscutting Concepts

Patterns
Graphs, charts and images can be used to identify patterns in data.

Heredity and Adaptation
TE: Investigation 1, Part 1, pp, 92-108
SE: *Fossil Dating,* pp. 3-10, *Mass Extinctions,* pp. 73-77
DR: "Biodiversity" (Online Slideshow), "Fossils" (Online Slideshow)

Investigation 1, Part 2, pp.
SE: *An Interview with Jennifer Clack,* pp. 11-16; *Transitions,* pp. 78-81
DR: Fish with Fingers (Video), Great Transitions: The Origin of Tetrapods (Video)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed
Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems

Constructing Explanations and Designing Solutions
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Stability and Change
Scale, Proportion, and Quantity
Structure and Function

GRADE 8

Biological Evolution: Unity and Diversity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-LS4-2

Students who demonstrate understanding can:
Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer their ancestral relationships.

***Clarification Statement**: Emphasis is on explanations of the ancestral relationships among organisms in terms of similarities or differences of the gross appearance of anatomical structures.*
***Assessment Boundary**: Assessment of comparisons is limited to gross appearance of anatomical structures*

Heredity and Adaptation
TE: Investigation 1, Part 2: response sheet, Investigation 1 I-Check

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evide4nce consistent with scientific ideas, principles, and theories.

Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events.

Heredity and Adaptation
TE: Investigation 1, Part 2, pp. 114-133
SE: *An Interview with Jennifer Clack,* pp. 11-16, *Transitions,* pp.78-81
DR: Fish with Fingers (Video), Great Transitions: The Origin of Tetrapods (Video)

Disciplinary Core Ideas

LS4A: Evidence of Common Ancestry and Diversity
Anatomical similarities and differences among modern organisms and between modern and fossil organisms in the fossil enable the reconstruction of the history and the inference of lines of ancestral relationships.

Heredity and Adaptation
TE: Investigation 1, Part 2, pp. 114-133
SE: *An Interview with Jennifer Clack,* pp. 11-16, *Transitions,* pp.78-81
DR: Fish with Fingers (Video), Great Transitions: The Origin of Tetrapods (Video)

Crosscutting Concepts

Patterns
Patterns can be used to identify cause-and effect relationships.

Heredity and Adaptation
TE: Investigation 1, Part 2, pp. 115-123

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigation Listed

Asking Questions and Defining Problem
Planning and Carrying Out Investigations
Developing and Using Models
Analyzing and Interpreting Data
Developing and Using Models
Planning and Carrying Out Investigations
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigation Listed

Stability and Change
Scale, Proportion, and Quantity
Structure and Function

GRADE 8

Biological Unity and Diversity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-LS4-4

Students who demonstrate understanding can:
Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

***Clarification Statement**: In a specific environment impacted by different factors, some traits provide advantages that make it more probable that an organism will be able to survive and reproduce there.*
***Assessment Boundary**: Assessment is limited to using simple probability statements and proportional reasoning to construct explanations.*

Heredity and Adaptation
TE: Investigation 3, Part 1: notebook entry
Investigation 3, Part 2: response sheet; Investigation 3 I-Check

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evide4nce consistent with scientific ideas, principles, and theories.

Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena.

Heredity and Adaptation
TE: Investigation 3, Part 1, pp. 250-272
SE: Adaptation, pp. 41-52
DR: "Walking Sticks: Eat Insects" (Online Activity)

Investigation 3, Part 2, pp. 278-284
SE: *Natural Selection,* pp. 53-59
DR: "Walking Sticks: Find Insects in Three Environments" (Online Activity), "Larkey Natural Selection (Online Activity), The Making of the Fittest (Video), The Origin of the Species (Video)

Disciplinary Core Ideas

LS4.B: Natural Selection
Natural selection leads to the predominance of certain traits in a population, and the suppression of others.

Heredity and Adaptation
. Investigation 3, Part 2, pp. 278-284
SE: *Natural Selection,* pp. 53-59
DR: "Walking Sticks: Find Insects in Three Environments" (Online Activity), Larkey Natural Selection (Online Activity), The Making of the Fittest (Video), The Origin of the Species (Video)

Crosscutting Concepts

Cause and Effect
Phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.

Heredity and Adaptation
Investigation 3, Part 1, pp. 251-256

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed
Developing and Using Models
Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Using Mathematical and Computational Thinking
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed
Patterns
Stability and Change

TE: Teacher Editions-Investigations Guide, Teacher Resources • SE: Student Edition-Science Resources Book • DR: Digital Resources

GRADE 8

Biological Evolution: Unity and Diversity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-LS4-5

Students who demonstrate understanding can:
Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Clarification Statement: *Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and on the impacts these technologies have on society and scientific discoveries.*
Assessment Boundary*: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.*

Heredity and Adaptation
TE: Investigation 3, Part 3: performance assessment

Science and Engineering Practices

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 6-8 builds upon K-5 experiences and progresses to evaluating the merit and validity of ideas and methods.

Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.

Heredity and Adaptation
TE: Investigation 3, Part 3, pp. 301-306
SE: *Influencing Evolution,* pp. 84-88
DR: *"Genetic Technology Resources"* (Online Activity)

Disciplinary Core Ideas

LS4.B: Natural Selection
In artificial selections, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring.

ETS2.A: Interdependence of Science, Engineering, and Technology
Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.

Heredity and Adaptation
TE: Investigation 3, Part 3, pp. 301-306
SE: *Influencing Evolution,* pp. 84-88
DR: *"Genetic Technology Resources"* (Online Activity)

Crosscutting Concepts

Cause and Effect
Phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.

Heredity and Adaptation
Cause and Effect relationships will be part of the research information that students will share.

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigation Listed

Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigation Listed

Patterns
Stability and Change
Systems and System Models

GRADE 8

Biological Evolution: Unity and Diversity

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-LS4-6

Students who demonstrate understanding can:
Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

***Clarification Statement**: Emphasis is on student explanations of trends in data using mathematical models, probability statements, and proportional reasoning to support explanations of trends of population changes.*
***Assessment Boundary**: Assessment does not include Hardy Weinberg calculations.*

Heredity and Adaptation
TE: Investigation 3, Part 2: response sheet, Investigation 3 I-Check

Science and Engineering Practices

Using Mathematical and Computational Thinking
Mathematical and computational thinking in 6-8 builds on K-5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

Use mathematical representation to support scientific conclusions and design solutions.

Heredity and Adaptation
TE: Investigation 3, Part 2, pp. 278-283
DR: "Walking Sticks: Find Insects in Three Environments" (Online Activity), "Larkey Natural Selection (Online Activity, The Making of the Fittest (Video)

Disciplinary Core Ideas

LS4.C: Adaptation
Adaptation by natural selection occurring over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.

Heredity and Adaptation
TE: Investigation 3, Part 2, pp. 278-296
SE: *Natural Selection,* pp. 53-59
DR: "Walking Sticks: Find Insects in Three Environments" (Online Activity), "Larkey Natural Selection (Online Activity, The Making of the Fittest (Video), Origin of the Species (Video), "Biodiversity" (Online Slide Show)

Crosscutting Concepts

Cause and Effect
Phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.

Heredity and Adaptation
TE: Investigation 3, Part 2, pp. 279-281, 292-293
DR: The Making of the Fittest (Video), Origin of the Species (Video), "Biodiversity" (Online Slide Show)

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigation Listed

Developing and Using Models
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigation Listed

Patterns
Stability and Change
Systems and System Models

GRADE 8

Earth's Place in the Universe

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-ESS1-1

Students who demonstrate understanding can:
Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, tides, and seasons.

***Clarification Statement**: Examples of models can be physical, graphical, or conceptual.*

Planetary Science
TE: Investigation 1, Part 3: performance assessment
Investigation 2, Part 1: performance assessment
Investigation 2, Part 2: response sheet
Investigation 2, Part 3: notebook entry, Investigation 1-2 I-Check
Investigation 3, Part 2: performance assessment
Investigation 4, Part 1: performance assessment
Investigation 4, Part 2: response sheet, notebook entry
Investigation 4, Part 3: notebook entry, Investigation 3-4 I-Check
Investigation 6, Part 2: performance assessment

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe a phenomenon.

Planetary Science
TE: Investigation 1, Part 3, pp. 145-150
DR: "US Naval Moon Phase Calendar" (Online Activity), "Earth System Images" (Online Slide Show)

Investigation 2, Part 1, pp. 173-183
DR: "Latitude and Longitude" (Online Activity), "Day/Night" (Online Activity)

Investigation 2, Part 2, pp. 187-194

Investigation 2, Part 3, pp. 200-222
SE: *Seasons on Earth,* pp. 15-21, *Eratoshenes: First to Measure Earth,* pp. 22-26, *Worldwide Sunrise/Sunset Data,* p. 131
DR: "Seasons" (Online Activity)

Investigation 3, Part 2, pp. 254-260
SE: *Earth/Moon Comparison,* pp. 134

Disciplinary Core Ideas

ESS1.A: The Universe and Its Stars
Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.

ESS1B: Earth and the Solar System
This model of the solar system can explain tides (including spring and neap), and eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term, but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.

Planetary Science
TE: Investigation 1, Part 3, pp. 145-150
DR: "US Naval Moon Phase Calendar" (Online Activity), "Earth System Images" (Online Slide Show)

Investigation 2, Part 1, pp. 173-183
DR: "Latitude and Longitude" (Online Activity), "Day/Night" (Online Activity)

Investigation 2, Part 2, pp. 187-194

Investigation 2, Part 3, pp. 200-222
SE: *Seasons on Earth,* pp. 15-21, *Eratoshenes: First to Measure Earth,* pp. 22-26, *Worldwide Sunrise/Sunset Data,* p. 131
DR: "Seasons" (Online Activity)

Crosscutting Concepts

Patterns
Patterns can be used to identify cause-and-effect relationships.

Planetary Science
Investigation 1, Part 3, pp. 145-150
DR: "US Naval Moon Phase Calendar" (Online Activity), "Earth System Images" (Online Slide Show)

Investigation 2, Part 1, pp. 173-183
DR: "Latitude and Longitude" (Online Activity), "Day/Night" (Online Activity)

Investigation 2, Part 2, pp. 187-194

Investigation 2, Part 3, pp. 200-222
SE: *Seasons on Earth,* pp. 15-21, *Eratoshenes: First to Measure Earth,* pp. 22-26, *Worldwide Sunrise/Sunset Data,* p. 131
DR: "Seasons" (Online Activity)

Investigation 4, Part 1, pp. 281-289
SE: *Moonrise/Sunrise Data,* p. 136
DR: "Moon Orientation" (Online Activity) "Lunar Calendar" (Online Activity)

Investigation 4, Part 2, pp. 294-299
SE: *Phases of the Moon Sequence Puzzle,* p. 137

Investigation 4, Part 3, pp. 302-307

Investigation 4, Part 1, pp. 281-289 **SE:** *Moonrise/Sunrise Data,* p. 136 **DR**: "Moon Orientation" (Online Activity) "Lunar Calendar" (Online Activity) Investigation 4, Part 2, pp. 294-299 **SE:** *Phases of the Moon Sequence Puzzle,* p. 137 Investigation 4, Part 3, pp. 302-307 **SE:** *Earth's Moon,* pp. 42-48 **DR**: "Phases of the Moon" (Online Activity) "Lunar Calendar" (Online Activity Investigation 6, Part 2, pp. 408-420 **SE:** *How Earth Got and Held onto Its Moon*, pp. 80-85 **DR:** "Tides" (Online Activity)	Investigation 3, Part 2, pp. 254-260 **SE:** *Earth/Moon Comparison,* pp. 134	**SE:** *Earth's Moon,* pp. 42-48 **DR**: "Phases of the Moon" (Online Activity) Lunar Calendar" (Online Activity

Additional Science and Engineering Practices Addressed in FOSS Next Generation Investigations Listed

Planning and Carrying Out Investigations
Asking Questions and Defining Problems
Analyzing and Interpreting Data
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematical and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Additional Crosscutting Concepts Addressed in FOSS Next Generation Investigations Listed

Energy and Matter
Stability and Change
Cause and Effect
Systems and System Models
Scale, Proportion, and Quantity

GRADE 8

Earth's Place in the Universe

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-ESS1-2

Students who demonstrate understanding can:
Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

***Clarification Statement**: Emphasis for the model is on effects of gravity as the force that hold together the solar system and Milky Way Galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).*
***Assessment Boundary**: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.*

Planetary Science
TE: Investigation 6, Part 1: notebook entry
Investigation 6, Part 2: performance assessment, Investigations 5-6 I-Check
Investigation 7, Part 1: notebook entry

Science and Engineering Practices

Developing and Using Models
Modeling in 6-8 builds on K-5 experiences and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop and use a model to describe a phenomenon.

Planetary Science
TE: Investigation 6, Part 1, pp. 381-401
SE: *The Cosmos in a Nutshell*

Investigation 6, Part 2, pp. 404-422
SE: *How the Earth Got and Held onto Its Moon,* pp.
DR: "Solar System Origin Card Sort" (Online Activity), "Origin of the Moon" (Online Activity), Tides (Online Activity)

Investigation 7, Part 1, pp. 444-448
SE: *Sun, Planets, and Satellites In the Solar System,* p. 135

DR: "Community Scale Model" (Online Activity)

Disciplinary Core Ideas

ESS1.A: The Universe and Its Stars
Earth and its solar system are part of the Milky Way galaxy, which is one of the many galaxies in the universe.

ESS1B: Earth and the Solar System
The solar system consists of the sun, planets, their moons, and other celestial objects that are held in orbit around the sun by its gravitational pull on them.

The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.

Planetary Science
TE: Investigation 6, Part 1, pp. 381-401
SE: *The Cosmos in a Nutshell*

Investigation 6, Part 2, pp. 404-422
SE: *How the Earth Got and Held onto Its Moon,* pp.
DR: "Solar System Origin Card Sort" (Online Activity), "Origin of the Moon" (Online Activity), Tides (Online Activity)

Investigation 7, Part 1, pp. 444-448
SE: *Sun, Planets, and Satellites in the Solar System,* p. 135
DR: "Community Scale Model" (Online Activity)

Crosscutting Concepts

Systems and System Models
Models can be used to represent systems and their interactions.

Planetary Science
TE: Investigation 6, Part 1, pp. 381-401
SE: *The Cosmos in a Nutshell*

Investigation 6, Part 2, pp. 404-422
SE: *How the Earth Got and Held onto Its Moon,* pp. : *Sun, Planets, and Satellites In the Solar System,* p. 135
DR: "Solar System Origin Card Sort" (Online Activity), "Origin of the Moon" (Online Activity), Tides (Online Activity)

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Stability and Change
Cause and Effect
Scale, Proportion, and Quantity

GRADE 8

Earth's Place in the Universe

The following FOSS program elements address the performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts indicated below. References are selected and do not reflect every possible alignment to a standard.

Performance Expectation 8-ESS1-3

Students who demonstrate understanding can:
Evaluate information to determine scale properties of objects in the solar system.

***Clarification Statement**: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.*
***Assessment Boundary**: Assessment does not include recalling facts about properties of the planets and other solar system bodies.*

Planetary Science
TE: Investigation 7, Part 1: notebook entry
Investigation 7, Part 2: notebook entry
Investigation 7, Part 3: notebook entry, Investigation 7 I-Check
Investigation 8, Part 1: notebook entry
Investigation 8, Part 2: performance assessment

Science and Engineering Practices

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 6-8 builds on K-5 experiences and progresses to evaluating the merit and validity of ideas and methods.

Integrate qualitative and/or quantitative scientific and/or technical information in text with that contained in media and visual displays to clarify claims and findings.

Planetary Science
TE: Investigation 7, Part 1, pp. 444-448
SE: *Sun, Planets, and Satellites in the Solar System,* pp. 135
DR: "Community Scale Model" (Online Activity)

Investigation 7, Part 2, pp. 453-459
DR: "Model of Jupiter's Atmosphere" (Online Activity), "Exoplanet Archive" (Online Activity), "Space Missions" (Online Resource)

Investigation 7, Part 3, pp. 463-468
SE: *Landforms of the United States,* p. 145; *Earth Landforms, Satellite Images,* pp. 146-149*; Earth Landforms, Descriptions,* pp. 150-153; *Planet Landforms, Images,* pp. 154-159 Planet Landforms, Descriptions, pp. 160-163; *A Tour of the Solar System,*

Disciplinary Core Ideas

ESS1.B: Earth and the Solar System
The solar system consists of the sun, planets, their moons, and other celestial objects that are held in orbit around the sun by its gravitational pull on them.

ETS2.A: Interdependence of Science, Engineering, and Technology
Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.

Planetary Science
TE: Investigation 7, Part 1, pp. 444-448
SE: *Sun, Planets, and Satellites in the Solar System,* pp. 135
DR: "Community Scale Model" (Online Activity)

Investigation 7, Part 2, pp. 453-459
DR: "Model of Jupiter's Atmosphere" (Online Activity), "Exoplanet Archive" (Online Activity), "Space Missions" (Online Resource)

Investigation 7, Part 3, pp. 463-468
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Crosscutting Concepts

Scale, Proportion, and Quantity
Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Planetary Science
TE: Investigation 7, Part 1, pp. 444-448
SE: *Sun, Planets, and Satellites in the solar System,* pp. 135
DR: "Community Scale Model" (Online Activity)

Investigation 7, Part 3, pp. 463-468
SE: *Landforms of the United States,* p. 145; *Earth Landforms, Satellite Images,* pp. 146-149*; Earth Landforms, Descriptions,* pp. 150-153; *Planet Landforms, Images,* pp. 154-159 Planet Landforms, Descriptions, pp. 160-163; *A Tour of the Solar System,* pp. 86-96
DR: "Search for Water" (Online Activity), "Solar System" (Online Activity)

Investigation 8, Part 1, pp. 506-520
SE: *The Hunt for Water,* pp. 105-109
DR: "Properties of Light" (Online Slide Show), "Comparing Spectra" (Online Activity)

Investigation 8, Part 2, pp. 523-529
SE: *Space Missions,* pp. 167-179
DR: Hubble's Amazing Universe (Video)

pp. 86- 96 **DR**: "Search for Water" (Online Activity), "Solar System" (Online Activity) Investigation 8, Part 1, pp. 506-520 **SE:** *The Hunt for Water,* pp. 105-109 **DR:** "Properties of Light" (Online Slide Show), "Comparing Spectra" (Online Activity) Investigation 8, Part 2, pp. 523-529 **SE:** *Space Missions,* pp. 167-179 **DR:** Hubble's Amazing Universe (Video)	160-163; *A Tour of the Solar System,* pp. 86- 96 **DR**: "Search for Water" (Online Activity), "Solar System" (Online Activity) Investigation 8, Part 1, pp. 506-520 **SE:** *The Hunt for Water,* pp. 105-109 **DR:** "Properties of Light" (Online Slide Show), "Comparing Spectra" (Online Activity) Investigation 8, Part 2, pp. 523-529 **SE:** *Space Missions,* pp. 167-179 **DR:** Hubble's Amazing Universe (Video)	

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