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Elevate Science Modules Grades 6-8 ©2019

To the

Montgomery County, Maryland Next Generation Science Standards Curriculum, Grade 6

Prepared by Savvas Learning Company, formerly Pearson K12 Learning

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To the
Montgomery County Next Generation Science Standards, Grade 6

Introduction

The following document demonstrates how the ***Elevate Science Middle Grades Modules ©2019*** program supports Montgomery County NGSS Science Curriculum for Grades 6-8. Correlation references include the Student Edition, Teacher Edition, and online Realize™ digital resources.

Savvas Learning Company is proud to introduce ***Elevate Science Modules*** for Middle Grades – where exploration is the heart of science! Designed to address the rigors of new science standards, students will experience science up close and personal, using real-world, relevant phenomena to solve project-based problems. Our newest program prepares students for the challenges of tomorrow, building strong reasoning skills and critical thinking strategies as they engage in explorations, formulate claims, and gather and analyze data that promote evidence-based arguments. The blended print and digital curriculum covers all Next Generation Science Standards at every grade level.

Elevate Science helps teachers transform learning, promote innovation, and manage their classroom.

Transform science classrooms by immersing students in active, three-dimensional learning.
Elevate Science engages students with real-world phenomena, open-ended Quests, uDemonstrate performance-based tasks, and in the engineering/design process with uEngineer It! investigations.

- A new 3-D learning model enhances best practices.
- Engineering-focused features infuse STEM learning.
- Phenomena-based activities put students at the heart of a Quest for knowledge.

Innovate learning by focusing on 21st century skills.
Students are encouraged to think, collaborate, and innovate! With ***Elevate Science***, students explore STEM careers, experience engineering activities, and discover our scientific and technological world. The content, strategies, and resources of Elevate Science equip the science classroom for scientific inquiry and science and engineering practices.

- Problem-based learning Quests put students on a journey of discovery.
- STEM connections help integrate curriculum.
- Coding and innovation engage students and build 21st century skills.

Manage the classroom with confidence.
Teachers will lead their class in asking questions and engaging in argumentation. Evidence-based assessments provide new options for monitoring student understanding.

- Professional development offers practical point-of-use support.
- Embedded standards in the program allow for easy integration.
- ELL and differentiated instruction strategies help instructors reach every learner.
- Interdisciplinary connections relate science to other subjects.

Designed for today's classroom, preparing students for tomorrow's world. ***Elevate Science*** promises to:

- Elevate thinking.
- Elevate learning.
- Elevate teaching.

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Table of Contents

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Unit 1: Matter and its Interactions	
Performance Expectation MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.	**Structure and Properties of Matter SE/TE:** Components of Matter, 8-10 Model It!, 9 Topic 1 Evidence-Based Assessment, 36-37 **Atoms and Chemical Reactions SE/TE:** A Modern Model of the Atom, 10-12 Lesson 1 Check, #5, 13 Forming Ionic Bonds, 41 Covalent Bonding, 42-44 Topic 1 Review and Assess, #5, 56-57 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 1: Describing and Classifying Matter>uInvestigate Lab: Modeling Atoms and Molecules;>Interactivity: Molecules and Extended Structures **Atoms and Chemical Reactions: Atoms and the Periodic Table** >Topic Launch: Atoms and the Periodic Table>uConnect Lab: Modeling Matter >Lesson 1: Atomic Theory>uInvestigate Lab: How Far Away is the Electron?
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.	**Structure and Properties of Matter SE/TE:** Components of Matter, 8-10 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 1: Describing and Classifying Matter>Interactivity: Molecules and Extended Structures
• Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).	**Structure and Properties of Matter SE/TE:** Types of Solids, 50

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Science and Engineering Practices	
• Develop a model to predict and/or describe phenomena.	**Structure and Properties of Matter SE/TE:** Model It!, 9 **Atoms and Chemical Reactions SE/TE:** Lesson 1 Check, #5, 13 Topic 1 Review and Assess, #5, 56-57 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 1: Describing and Classifying Matter>uInvestigate Lab: Modeling Atoms and Molecules;>Interactivity: Molecules and Extended Structures **Atoms and Chemical Reactions: Atoms and the Periodic Table** >Topic Launch: Atoms and the Periodic Table>uConnect Lab: Modeling Matter >Lesson 1: Atomic Theory>uInvestigate Lab: How Far Away is the Electron?
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.	**Structure and Properties of Matter SE/TE:** Model It!, 9 Topic 1 Evidence-Based Assessment, 36-37 **Atoms and Chemical Reactions SE/TE:** The First Theories on Atoms, 6 Lesson 1 Check, #5, 13 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 1: Describing and Classifying Matter>uInvestigate Lab: Modeling Atoms and Molecules;>Interactivity: Molecules and Extended Structures **Atoms and Chemical Reactions: Atoms and the Periodic Table** >Topic Launch: Atoms and the Periodic Table>uConnect Lab: Modeling Matter >Lesson 1: Atomic Theory>uInvestigate Lab: How Far Away is the Electron?

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Performance Expectation MS-PS1-2: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	**Structure and Properties of Matter SE/TE:** Physical Changes in Matter, 25-26 Chemical Changes in Matter, 27-28 **Atoms and Chemical Reactions SE/TE:** Changing Matter, 79-80 Evidence of Chemical Reactions, 82-83 Lesson 2 Check, #2, 88 Topic 2 Evidence-Based Assessment, 110-111 uDemonstrate Lab, 112-115 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 3: Changes in Matter>Inquiry Warm-Up Lab: Is a New Substance Formed?;>uInvestigate Lab: Physical and Chemical Changes;>Quest Check-In Lab: Cinematic Science **Atoms and Chemical Reactions: Chemical Reactions** >Topic Launch: Chemical Reactions>uConnect Lab: What Happens When Chemicals React? >Lesson 2: Chemical Change>Inquiry Warm-Up Lab: Presto Change-O!;>uInvestigate Lab: Changes in a Burning Candle
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.	**Structure and Properties of Matter SE/TE:** Matter, 5-7 Using Density, 20 Math Toolbox, 20 **Atoms and Chemical Reactions SE/TE:** Properties of Pure Substances, 101 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 2: Measuring Matter>uInvestigate Lab: Observing Physical Properties

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
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.	**Structure and Properties of Matter SE/TE:** Chemical Changes in Matter, 27-28 Math Toolbox, 29 **Atoms and Chemical Reactions SE/TE:** Chemical Change, 80 Building and Breaking Chemical Bonds, 81 Evidence of Chemical Reactions, 82-83 Types of Chemical Reactions, 96
Science and Engineering Practices	
Analyzing and Interpreting Data	
• Analyze and interpret data to determine similarities and differences in findings.	**Atoms and Chemical Reactions SE/TE:** Lesson 2 Check, #2, 88 Topic 2 Evidence-Based Assessment, #4, 110-111 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 3: Changes in Matter>uInvestigate Lab: Physical and Chemical Changes;>Quest Check-In Lab: Cinematic Science **Atoms and Chemical Reactions: Chemical Reactions** >Topic Launch: Chemical Reactions>uConnect Lab: What Happens When Chemicals React? >Lesson 2: Chemical Change>Inquiry Warm-Up Lab: Presto Change-O!

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Connections to Nature of Science	
Scientific Knowledge is Based on Empirical Evidence	
• Science knowledge is based upon logical and conceptual connections between evidence and explanations.	**Structure and Properties of Matter SE/TE:** Math Toolbox, 29 Lesson 3 Check, #2, 32 **Atoms and Chemical Reactions SE/TE:** Literacy Connection, 80 Topic 2 Evidence-Based Assessment, #4, 110-111 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 3: Changes in Matter>uInvestigate Lab: Physical and Chemical Changes;>Quest Check-In Lab: Cinematic Science **Atoms and Chemical Reactions: Chemical Reactions** >Topic Launch: Chemical Reactions>uConnect Lab: What Happens When Chemicals React? >Lesson 2: Chemical Change>Inquiry Warm-Up Lab: Presto Change-O!;>uInvestigate Lab: Changes in a Burning Candle
Crosscutting Concepts	
Patterns	
• Macroscopic patterns are related to the nature of microscopic and atomic- level structure.	**Atoms and Chemical Reactions SE/TE:** Building and Breaking Chemical Bonds, 81 uDemonstrate Lab, 112-115

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Performance Expectation MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	**Atoms and Chemical Reactions SE/TE:** Synthetic Materials, 99-102 Impact of Synthetic Materials, 103-104 Case Study: Is Plastic Really So Fantastic?, 106-107 Topic 2 Review and Assess, #17, 108-109 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 4: Producing Useful Materials>Interactivity: Describe the Impact of Synthetics;>uInvestigate Lab: Making Plastic From Starch;>Interactivity: The Impact of Synthetics
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.	**Atoms and Chemical Reactions SE/TE:** Properties of Pure Substances, 101
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.	**Atoms and Chemical Reactions SE/TE:** Building and Breaking Chemical Bonds, 81 Evidence of Chemical Reactions, 82-83 Types of Chemical Reactions, 96 Synthetic Materials, 99-102
Science and Engineering Practices	
Obtaining, Evaluating, and Communicating Information	
• 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 now supported by evidence.	**Atoms and Chemical Reactions SE/TE:** Accidental Synthetics, 101 Literacy Connection, 103 Reading Check, 104 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 4: Producing Useful Materials>uInvestigate Lab: Making Plastic From Starch;>Interactivity: The Impact of Synthetics
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.	**Atoms and Chemical Reactions SE/TE:** Lesson 4 Check, #4, 105 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 4: Producing Useful Materials>uInvestigate Lab: Making Plastic From Starch

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Connections to Engineering, Technology, and Applications of Science	
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.	**Atoms and Chemical Reactions SE/TE:** Synthetic Materials, 99-102 Impact of Synthetic Materials, 103-104
Influence of Science, Engineering and Technology on Society and the Natural World	
• The uses of technologies and any limitation 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.	**Atoms and Chemical Reactions SE/TE:** Natural Resources as Building Blocks, 100 Impact of Synthetic Materials, 103-104
Performance Expectation MS-PS1-4: 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.	**Structure and Properties of Matter SE/TE:** Thermal Energy and Temperature, 57 Changes of State Between Solid and Liquid, 58-59 Changes of State Between Liquid and Gas, 60-62 Changing State from Solid to Gas, 63 Model It!, 63 Connect It!, 66 Pressure and Temperature of a Gas, 67-68 Temperature and Volume, 69-70 How Pistons Work, 74 Topic 2 Review and Assess, #11, 78-79 Topic 2 Evidence-Based Assessment, 80-81 uDemonstrate Lab, 82-85 **Realize™ Digital Resources:** **Structure and Properties of Matter: Solids, Liquids, and Gases** >Lesson 2: Changes of State>Interactivity: States of Matter;>Worksheet: States of Matter;>Interactivity: Thermal Energy and Changes of State
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.	**Structure and Properties of Matter SE/TE:** Particles of a Liquid, 51 Particles of a Gas, 53

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
• 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.	**Structure and Properties of Matter SE/TE:** Particles of a Solid, 48 Particles of a Liquid, 51 Particles of a Gas, 53 Topic 2 Review and Assess, #5, 78-79 **Realize™ Digital Resources:** **Structure and Properties of Matter: Solids, Liquids, and Gases** >Lesson 1: States of Matter>uInvestigate Lab: Properties of Matter
• The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.	**Structure and Properties of Matter SE/TE:** Changes of State Between Solid and Liquid, 58-59 Changes of State Between Liquid and Gas, 60-62 Changing State from Solid to Gas, 63 Model It!, 63 Topic 2 Review and Assess, #11, 78-79 Topic 2 Evidence-Based Assessment, 80-81 **Realize™ Digital Resources:** **Structure and Properties of Matter: Solids, Liquids, and Gases** >Lesson 2: Changes of State>Interactivity: States of Matter;>Worksheet: States of Matter
PS3.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. (secondary)	**Structure and Properties of Matter SE/TE:** Thermal Energy, 57
• 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. 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. (secondary)	**Structure and Properties of Matter SE/TE:** Temperature and Thermal Energy, 30 Thermal Energy and Temperature, 57

Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Science and Engineering Practices	
Developing and Using Models	
• Develop a model to predict and/or describe phenomena.	**Structure and Properties of Matter SE/TE:** Model It!, 63 Topic 2 Evidence-Based Assessment, #3, 80-81 uDemonstrate Lab, 82-85 **Realize™ Digital Resources:** **Structure and Properties of Matter: Solids, Liquids, and Gases** >Lesson 2: Changes of State>Interactivity: States of Matter;>Worksheet: States of Matter
Crosscutting Concepts	
Cause and Effect	
• Cause and effect relationships may be used to predict phenomena in natural or designed systems.	**Structure and Properties of Matter SE/TE:** Write About It, 58 Lesson 2 Check, #1, 64
Performance Expectation MS-PS1-5: 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.	**Atoms and Chemical Reactions SE/TE:** Chemical Equations, 91-93 Model It!, 92 Law of Conservation of Mass, 94-95 Topic 2 Evidence-Based Assessment, 110-111 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 3: Modeling Chemical Reactions>uInvestigate Lab: Is Matter Conserved?;>Interactivity: Model the Conservation of Mass
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.	**Atoms and Chemical Reactions SE/TE:** Building and Breaking Chemical Bonds, 81 Types of Chemical Reactions, 96
• The total number of each type of atom is conserved, and thus the mass does not change.	**Atoms and Chemical Reactions SE/TE:** Model It!, 92 Law of Conservation of Mass, 94-95 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 3: Modeling Chemical Reactions>uInvestigate Lab: Is Matter Conserved?

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Science and Engineering Practices	
Developing and Using Models	
• Develop a model to describe unobservable mechanisms.	**Atoms and Chemical Reactions SE/TE:** Model It!, 92 Topic 2 Evidence-Based Assessment, #3, 110-111 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 3: Modeling Chemical Reactions>uInvestigate Lab: Is Matter Conserved?;>Interactivity: Model the Conservation of Mass
Connections to Nature of Science	
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	
• Laws are regularities or mathematical descriptions of natural phenomena.	**Atoms and Chemical Reactions SE/TE:** Law of Conservation of Mass, 94-95
Crosscutting Concepts	
Energy and Matter	
• Matter is conserved because atoms are conserved in physical and chemical processes.	**Atoms and Chemical Reactions SE/TE:** Model It!, 92 Law of Conservation of Mass, 94-95 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 3: Modeling Chemical Reactions>Interactivity: Model the Conservation of Mass

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Performance Expectation MS-PS1-6: Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	**Atoms and Chemical Reactions SE/TE:** Quest Kickoff, 66-67 Changes in Energy, 84 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Topic Launch: Chemical Reactions>Quest Kickoff: Hot and Cool Chemistry >Lesson 1: Mixtures and Solutions>Quest Check-In Lab: Energy Salts >Lesson 2: Chemical Change>Quest Check-In Interactivity: Design Your Pack >Lesson 3: Modeling Chemical Reactions>Quest Check-In Lab: Pack Building >Lesson 4: Producing Useful Materials>Quest Check-In Lab: Heat It Up or Ice It Down
Disciplinary Core Ideas	
PS1.B: Chemical Reactions	
• Some chemical reactions release energy, others store energy.	**Atoms and Chemical Reactions SE/TE:** Changes in Energy, 84 Energy Graphs for Chemical Reactions, 85 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 2: Chemical Change>Interactivity: Analyze Exothermic and Endothermic Graphs
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. (secondary)	**Atoms and Chemical Reactions SE/TE:** Test and Evaluate a Solution, 126 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 3: Modeling Chemical Reactions>Quest Check-In Lab: Pack Building >Lesson 4: Producing Useful Materials>Quest Check-In Lab: Heat It Up or Ice It Down

SE = Student Edition **TE= Teacher Edition**

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
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. (secondary)	**Atoms and Chemical Reactions SE/TE:** Redesign and Retest the Solution, 127 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 3: Modeling Chemical Reactions>Quest Check-In Lab: Pack Building >Lesson 4: Producing Useful Materials>Quest Check-In Lab: Heat It Up or Ice It Down
• 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. (secondary)	**Atoms and Chemical Reactions SE/TE:** Test and Evaluate a Solution, 126 Redesign and Retest the Solution, 127 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 3: Modeling Chemical Reactions>Quest Check-In Lab: Pack Building >Lesson 4: Producing Useful Materials>Quest Check-In Lab: Heat It Up or Ice It Down
Science and Engineering Practices	
Constructing Explanations and Designing Solutions	
• Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.	**Atoms and Chemical Reactions SE/TE:** Quest Kickoff, 66-67 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Topic Launch: Chemical Reactions>Quest Kickoff: Hot and Cool Chemistry >Lesson 1: Mixtures and Solutions>Quest Check-In Lab: Energy Salts >Lesson 2: Chemical Change>Quest Check-In Interactivity: Design Your Pack >Lesson 3: Modeling Chemical Reactions>Quest Check-In Lab: Pack Building >Lesson 4: Producing Useful Materials>Quest Check-In Lab: Heat It Up or Ice It Down

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Crosscutting Concepts	
Energy and Matter	
• The transfer of energy can be tracked as energy flows through a designed or natural system.	**Atoms and Chemical Reactions SE/TE:** Changes in Energy, 84 Energy Graphs for Chemical Reactions, 85 **Realize™ Digital Resources:** **Atoms and Chemical Reactions: Chemical Reactions** >Lesson 1: Mixtures and Solutions>Quest Check-In Lab: Energy Salts
Performance Expectation MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	**Changing Earth and Human Activity SE/TE:** uEngineer It!, 73 Quest Kickoff, 102-103 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Topic Launch: Human Impacts on the Environment>uConnect Lab: Finding a Solution for Your Pollution;>Quest Kickoff: Trash Backlash >Lesson 4: Water Pollution>Quest Check-In Lab: Reducing Waste
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.	**Changing Earth and Human Activity SE/TE:** Using Energy Resources, 64 Impact on the Earth System, 109 Acid Rain, 116 Wetlands, 129
• 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.	**Changing Earth and Human Activity SE/TE:** The Human Population, 105 Using Natural Resources, 108-109 Balancing Needs, 110
Science and Engineering Practices	
Constructing Explanations and Designing Solutions	
• Apply scientific principles to design an object, tool, process or system.	**Changing Earth and Human Activity SE/TE:** uEngineer It!, 73 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Topic Launch: Human Impacts on the Environment>uConnect Lab: Finding a Solution for Your Pollution >Lesson 4: Water Pollution>Quest Check-In Lab: Reducing Waste

SE = Student Edition **TE= Teacher Edition**

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Crosscutting Concepts	
Cause and Effect	
• Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.	**Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Topic Launch: Human Impacts on the Environment>uConnect Lab: Finding a Solution for Your Pollution
Connections to Engineering, Technology, and Applications of Science	
Influence of Science, Engineering, and Technology 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 and over time.	**Changing Earth and Human Activity SE/TE:** Alternative Sources of Energy, 68-71 Lesson 2 Check, #4, 72 uEngineer It!, 73
Performance Expectation MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per- capita consumption of natural resources impact Earth's systems.	**Changing Earth and Human Activity SE/TE:** Connect It!, 104 The Human Population, 105 Using Natural Resources, 108-109 Topic 3 Evidence-Based Assessment, 148-149 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Lesson 1: Population Growth and Resource Consumption>Interactivity: Human Population Growth;>Worksheet: Human Population Growth;>uInvestigate Lab: Doubling Time
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.	**Changing Earth and Human Activity SE/TE:** The Human Population, 105 Using Natural Resources, 108-109 Balancing Needs, 110 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Lesson 1: Population Growth and Resource Consumption>uInvestigate Lab: Doubling Time

SE = Student Edition **TE= Teacher Edition**

Digital Resources: The symbol > indicates a click to reach each digital asset on the Realize platform.

Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Science and Engineering Practices	
• Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	**Changing Earth and Human Activity SE/TE:** Reading Check, 110 Lesson 1 Check, #3, 111 Topic 3 Evidence-Based Assessment, #4, 148-149 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Lesson 1: Population Growth and Resource Consumption>Worksheet: Human Population Growth;>ulnvestigate Lab: Doubling Time
Crosscutting Concepts	
Cause and Effect	
• Cause and effect relationships may be used to predict phenomena in natural or designed systems.	**Changing Earth and Human Activity SE/TE:** Impact of Agriculture, 109 Topic 3 Review and Assess, #4, 146-147 Topic 3 Evidence-Based Assessment, #2, 148-149 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Lesson 1: Population Growth and Resource Consumption>Worksheet: Human Population Growth;>ulnvestigate Lab: Doubling Time
Connections to Engineering, Technology, and Applications of Science	
Influence of Science, Engineering, and Technology 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.	**Changing Earth and Human Activity SE/TE:** Using Energy Resources, 64 Humans and Minerals, 80 Human Impacts, 88-89 Using Natural Resources, 108-109 Outdoor Air Pollution, 114-116 Nutrient Depletion, 126 Wetlands, 129 Human Activities, 140-141
Connections to Nature of Science	
Science Addresses Questions About the Natural and Material World	
• Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.	**Changing Earth and Human Activity SE/TE:** Balancing Needs, 110

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Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Performance Expectation MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	**Structure and Properties of Matter SE/TE:** uEngineer It!, 55 **Realize™ Digital Resources:** **Forces: Forces and Motion** >Lesson 1: Describing Motion and Force>Quest Check-In Interactivity: Define Criteria and Constraints **Changing Earth and Human Activity: Earth's Surface Systems** >Lesson 2: Erosion and Deposition>Quest Check-In Lab: Ingenious Island Part I **Systems, Reproduction, and Growth: Reproduction and Growth** >Lesson 4: Factors Influencing Growth>Quest Check-In Interactivity: Make Your Construction Case
Disciplinary Core Ideas	
ETS1.A: Defining and Delimiting Engineering Problems	
• 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 are likely to limit possible solutions.	**Structure and Properties of Matter SE/TE:** Define the Problem, 94-95
Science and Engineering Practices	
Asking Questions and Defining Problems	
• Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.	**Structure and Properties of Matter SE/TE:** uEngineer It!, 55 **Earth Systems SE/TE:** uEngineer It!, 59 **Diversity of Life SE/TE:** uEngineer It!, 89 **Realize™ Digital Resources:** **Forces: Forces and Motion** >Lesson 1: Describing Motion and Force>Quest Check-In Interactivity: Define Criteria and Constraints **Changing Earth and Human Activity: Earth's Surface Systems** >Lesson 2: Erosion and Deposition>Quest Check-In Lab: Ingenious Island Part I **Systems, Reproduction, and Growth: Reproduction and Growth** >Lesson 4: Factors Influencing Growth>Quest Check-In Interactivity: Make Your Construction Case

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Crosscutting Concepts	
Influence of Science, Engineering, and Technology 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.	**Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 135 **Changing Earth and Human Activity SE/TE:** Using Energy Resources, 64 uEngineer It!, 73 Humans and Minerals, 80 Human Impacts, 88-89 Using Natural Resources, 108-109 Wetlands, 129 Human Activities, 140-141
• 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.	**Atoms and Chemical Reactions SE/TE:** uEngineer It!, 77 Impact of Synthetic Materials, 103-104 **Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 21 uEngineer It!, 135 **Earth Systems SE/TE:** uEngineer It!, 59 uEngineer It!, 131 **Realize™ Digital Resources:** **Earth Systems: Plate Tectonics** >Lesson 3: Earthquakes and Tsunami Hazards>Interactivity: Earthquake Engineering

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Performance Expectation MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	**Energy Transfer SE/TE:** uEngineer It!, 21 **Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 21 **Systems, Reproduction, and Growth SE/TE:** uEngineer It!, 37 uEngineer It!, 123 **Relationships Within Ecosystems SE/TE:** uEngineer It!, 13 **Realize™ Digital Resources:** **Energy Transfer: Thermal Energy** >Lesson 3: Heat and Materials>Quest Check-In Lab: Keep the Heat In
Disciplinary Core Ideas	
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.	**Energy Transfer SE/TE:** Test and Evaluate a Solution, 98
Science and Engineering Practices	
• Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	**Energy Transfer SE/TE:** uEngineer It!, 21 **Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 21 **Systems, Reproduction, and Growth SE/TE:** uEngineer It!, 37 uEngineer It!, 123 **Relationships Within Ecosystems SE/TE:** uEngineer It!, 13 **Realize™ Digital Resources:** **Energy Transfer: Thermal Energy** >Lesson 3: Heat and Materials>Quest Check-In Lab: Keep the Heat In

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Unit 2: Ecosystems Interactions, Energy, and Dynamics	
Performance Expectation MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	**Relationships Within Ecosystems SE/TE:** Levels of Organization, 39 Math Toolbox, 40 Factors That Limit Population Growth, 42 Case Study: The Case of the Disappearing Cerulean Warbler, 44-45 Topic 2 Review and Assess, #5, 66-67 uDemonstrate Lab, 70-73 Math Toolbox, 83 Ecosystem Disruptions and Population Survival, 92-93 Topic 3 Evidence-Based Assessment, 122-123 uDemonstrate Lab, 124-127 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 1: Living Things and the Environment>Interactivity: An Ecological Mystery;>uInvestigate Lab: Elbow Room **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 2: Dynamic and Resilient Ecosystems>Interactivity: A Butterfly Mystery
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.	**Relationships Within Ecosystems SE/TE:** Connect It!, 36 Organisms and Habitats, 37-38 Mutualism and Commensalism, 85 Ecosystem Disruptions and Population Survival, 92-93 Case Study: The Dependable Elephant, 108-109 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 1: Living Things and the Environment>Interactivity: An Ecological Mystery
• 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.	**Relationships Within Ecosystems SE/TE:** Space and Shelter, 42 Competition and Predation, 81-83 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 1: Interactions in Ecosystems>uInvestigate Lab: Competition and Predation

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• Growth of organisms and population increases are limited by access to resources.	**Relationships Within Ecosystems SE/TE:** Factors That Limit Population Growth, 42 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 1: Living Things and the Environment>uInvestigate Lab: Elbow Room
Science and Engineering Practices	
• Analyze and interpret data to provide evidence for phenomena.	**Relationships Within Ecosystems SE/TE:** Math Toolbox, 40 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 1: Living Things and the Environment>Interactivity: An Ecological Mystery;>uInvestigate Lab: Elbow Room **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 2: Dynamic and Resilient Ecosystems>Interactivity: A Butterfly Mystery
Crosscutting Concepts	
• Cause and effect relationships may be used to predict phenomena in natural or designed systems.	**Relationships Within Ecosystems SE/TE:** Limited Space, 42 Quest Check-In, 43 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 1: Living Things and the Environment>Interactivity: An Ecological Mystery **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 2: Dynamic and Resilient Ecosystems>Interactivity: A Butterfly Mystery

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Performance Expectation MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	**Relationships Within Ecosystems SE/TE:** Competition and Predation, 81-83 Symbiotic Relationships, 84-86 Lesson 1 Check, #4, 87 Topic 3 Review and Assess, #5, 120-121 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 1: Interactions in Ecosystems>Interactivity: Symbiotic Relationships;>uInvestigate Lab: Competition and Predation;>Interactivity: Shared Interactions
Disciplinary Core Ideas	
LS2.A: Interdependent Relationships in Ecosystems	
• Similarly, 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.	**Relationships Within Ecosystems SE/TE:** Competition and Predation, 81-83 Mutualism, 84 Ecosystem Disruptions and Population Survival, 92-93 Case Study: The Dependable Elephant, 108-109 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 1: Interactions in Ecosystems>Interactivity: Shared Interactions
Science and Engineering Practices	
Constructing Explanations and Designing Solutions	
• Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.	**Relationships Within Ecosystems SE/TE:** Lesson 1 Check, #4, 87 Topic 3 Review and Assess, #5, 120-121 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 1: Interactions in Ecosystems>Interactivity: Symbiotic Relationships;>uInvestigate Lab: Competition and Predation;>Interactivity: Shared Interactions
Crosscutting Concepts	
Patterns	
• Patterns can be used to identify cause and effect relationships.	**Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 1: Interactions in Ecosystems>Interactivity: Symbiotic Relationships;>uInvestigate Lab: Competition and Predation;>Interactivity: Shared Interactions

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Performance Expectation MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	**Relationships Within Ecosystems SE/TE:** Energy Roles in an Ecosystem, 47-49 Energy and Matter Transfer, 50-53 Model It!, 51 Model It!, 58 Water Cycle, 58-59 Carbon and Oxygen Cycles, 60-61 Nitrogen Cycles in Ecosystems, 62-63 Lesson 3 Check, #3, 64 Topic 2 Review and Assess, #9, 66-67 Topic 2 Evidence-Based Assessment, 68-69 uDemonstrate Lab, 70-73 Interactions Between Cycles of an Ecosystem, 114 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 2: Energy Flows in Ecosystems>Interactivity: Energy Roles and Flows;>Enrichment: Building an Ocean Food Web >Lesson 3: Cycles of Matter>uInvestigate Lab: Following Water;>Interactivity: Earth's Recyclables
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.	**Relationships Within Ecosystems SE/TE:** Energy Roles in an Ecosystem, 47-49 Food Webs, 50 Model It!, 51 Energy Pyramids, 52 Conservation of Matter and Energy, 57 Water Cycle, 58-59 Carbon and Oxygen Cycles, 60-61 Nitrogen Cycles in Ecosystems, 62-63 Topic 2 Review and Assess, #9, #16, #17, 66-67 Topic 2 Evidence-Based Assessment, 68-69 uDemonstrate Lab, 70-73 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 2: Energy Flows in Ecosystems>uInvestigate Lab: Observing Decomposition;>Enrichment: Building an Ocean Food Web >Lesson 3: Cycles of Matter>Interactivity: Cycles of Matter

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Science and Engineering Practices	
Developing and Using Models	
• Develop a model to describe phenomena.	**Relationships Within Ecosystems SE/TE:** Model It!, 51 Model It!, 58 Lesson 3 Check, #3, 64 Topic 2 Review and Assess, #9, 66-67 uDemonstrate Lab, 70-73 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 2: Energy Flows in Ecosystems>Enrichment: Building an Ocean Food Web >Lesson 3: Cycles of Matter>uInvestigate Lab: Following Water;>Interactivity: Earth's Recyclables
Crosscutting Concepts	
Energy and Matter	
• The transfer of energy can be tracked as energy flows through a natural system.	**Relationships Within Ecosystems SE/TE:** Energy Pyramids, 52 Energy Availability, 53 Math Toolbox, 53 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 2: Energy Flows in Ecosystems>Interactivity: Energy Roles and Flows;>Enrichment: Building an Ocean Food Web
Connections to Nature of Science	
Scientific Knowledge Assumes an Order and Consistency in Natural Systems	
• Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.	**Relationships Within Ecosystems SE/TE:** Energy Pyramids, 52 Energy Availability, 53 Math Toolbox, 53 Lesson 2 Check, #4, 54 Conservation of Matter and Energy, 57

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Performance Expectation MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	**Relationships Within Ecosystems SE/TE:** Succession, 89-91 Ecosystem Disruptions and Population Survival, 92-93 Lesson 2 Check, #2, 94 Case Study: The Dependable Elephant, 108-109 Connect It!, 110 Topic 3 Evidence-Based Assessment, 122-123 uDemonstrate Lab, 124-127 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Topic Launch: Populations, Communities, and Ecosystems>uConnect Lab: How Communities Change >Lesson 2: Dynamic and Resilient Ecosystems>Interactivity: Succession in an Ecosystem;>Interactivity: A Butterfly Mystery
Disciplinary Core Ideas	
LS2.C: Ecosystem 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.	**Relationships Within Ecosystems SE/TE:** Case Study: The Case of the Disappearing Cerulean Warbler, 44-45 Succession, 89-91 Ecosystem Disruptions and Population Survival, 92-93 Damaging Biodiversity, 104 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 2: Dynamic and Resilient Ecosystems>Interactivity: Succession in an Ecosystem;>Interactivity: A Butterfly Mystery
Science and Engineering Practices	
• Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	**Relationships Within Ecosystems SE/TE:** Secondary Succession, 91 Lesson 2 Check, #2, 94 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 2: Dynamic and Resilient Ecosystems>Interactivity: A Butterfly Mystery

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Connections to Nature of Science	
Scientific Knowledge is Based on Empirical Evidence	
• Science disciplines share common rules of obtaining and evaluating empirical evidence.	**Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 2: Dynamic and Resilient Ecosystems>Interactivity: A Butterfly Mystery
Crosscutting Concepts	
Stability and Change	
• Small changes in one part of a system might cause large changes in another part.	**Relationships Within Ecosystems SE/TE:** Secondary Succession, 91 Changes to Populations, 92 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 2: Dynamic and Resilient Ecosystems>Interactivity: Succession in an Ecosystem;>Interactivity: A Butterfly Mystery
Performance Expectation MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	**Relationships Within Ecosystems SE/TE:** Quest Kickoff, 76-77 Biodiversity in Ecosystems, 115 Design It!, 117 uEngineer It!, 119 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Topic Launch: Populations, Communities, and Ecosystems>Quest Kickoff: To Cross or Not to Cross >Lesson 3: Biodiversity>Quest Check-In Lab: Design and Model a Crossing >Lesson 4: Ecosystem Services>uInvestigate Lab: Ecosystem Impacts;>uEngineer It! Interactivity: Maintaining Marine Ecosystems;>Interactivity: Walk This Way or That Way
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.	**Relationships Within Ecosystems SE/TE:** The Value of Biodiversity, 97-99 Lesson 3 Check, #2, 107

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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.(secondary)	**Relationships Within Ecosystems SE/TE:** Economic Value, 98 Damaging Biodiversity, 104 Ecosystem Services, 111-113 Factors Impacting Ecosystem Diversity, 115-116
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. (secondary)	**Relationships Within Ecosystems SE/TE:** Biodiversity in Ecosystems, 115 Design It!, 117 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 3: Biodiversity>Quest Check-In Lab: Design and Model a Crossing >Lesson 4: Ecosystem Services>uInvestigate Lab: Ecosystem Impacts
Science and Engineering Practices	
• Evaluate competing design solutions based on jointly developed and agreed- upon design criteria.	**Relationships Within Ecosystems SE/TE:** Design It!, 117 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 3: Biodiversity>Quest Check-In Lab: Design and Model a Crossing >Lesson 4: Ecosystem Services>uInvestigate Lab: Ecosystem Impacts
Crosscutting Concepts	
Stability and Change	
• Small changes in one part of a system might cause large changes in another part.	**Relationships Within Ecosystems SE/TE:** Quest Check-In, 107 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 3: Biodiversity>Quest Check-In Lab: Design and Model a Crossing

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Connections to Engineering, Technology, and Applications of Science	
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.	**Relationships Within Ecosystems SE/TE:** Quest Kickoff, 76-77 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Topic Launch: Populations, Communities, and Ecosystems>Quest Kickoff: To Cross or Not to Cross >Lesson 3: Biodiversity>Quest Check-In Lab: Design and Model a Crossing
Connections to Nature of Science	
Science Addresses Questions About the Natural and Material World	
• Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.	**Relationships Within Ecosystems SE/TE:** Human Activities, 116 Conservation, 117 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 4: Ecosystem Services>Interactivity: Walk This Way or That Way

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Unit 3: Human Impacts on the Environment	
Performance Expectation MS-ESS3-1: 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.	**Changing Earth and Human Activity SE/TE:** The Essential Question, 53 Fossil Fuels, 58-62 Nuclear Energy, 63 Lesson 1 Check, #5, 65 Minerals and Ores, 75-79 Lesson 3 Check, #3, 81 Water on Earth, 85-87 Lesson 4 Check, #2, 90 Topic 2 Review and Assess, #13, 92-93 Topic 2 Evidence-Based Assessment, 94-95 uDemonstrate Lab, 96-99 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Distribution of Natural Resources** >Lesson 1: Nonrenewable Energy Resources>Interactivity: Distribution of Fossil Fuels >Lesson 3: Mineral Resources>Interactivity: Distribution of Minerals
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.	**Changing Earth and Human Activity SE/TE:** Natural Resources, 57 Coal Formation and Distribution, 59 Petroleum Formation and Distribution, 61 Distribution of Uranium, 63 Using Energy Resources, 64 Distribution of Minerals, 78-79 Humans and Minerals, 80 Case Study: Phosphorus Fiasco, 82-83 Water on Earth, 85 Human Impacts, 88-89 Human Activity, 108 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Distribution of Natural Resources** >Lesson 1: Nonrenewable Energy Resources>Inquiry Warm-Up Lab: Using Resources

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Science and Engineering Practices	
Constructing Explanations and Designing Solutions	
• 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.	**Changing Earth and Human Activity SE/TE:** Coal Formation and Distribution, 59 Lesson 1 Check, #5, 65 Lesson 4 Check, #2, 90 Topic 2 Review and Assess, #13, 92-93 Topic 2 Evidence-Based Assessment, #4, 94-95 uDemonstrate Lab, 96-99 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Distribution of Natural Resources** >Lesson 1: Nonrenewable Energy Resources>Interactivity: Distribution of Fossil Fuels >Lesson 3: Mineral Resources>Interactivity: Distribution of Minerals
Crosscutting Concepts	
Cause and Effect	
• Cause and effect relationships may be used to predict phenomena in natural or designed systems.	**Changing Earth and Human Activity SE/TE:** Lesson 1 Check, #2, 65 Minerals from Magma, 77 Lesson 3 Check, #3, 81 uDemonstrate Lab, 96-99 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Distribution of Natural Resources** >Lesson 1: Nonrenewable Energy Resources>uInvestigate Lab: Fossil Fuels
Connections to Engineering, Technology, and Applications of Science	
Influence of Science, Engineering, and Technology 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.	**Changing Earth and Human Activity SE/TE:** Natural Resources, 56 Using Energy Resources, 64 Humans and Minerals, 80 Human Impacts, 88-89

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Performance Expectation MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	**Changing Earth and Human Activity SE/TE:** uEngineer It!, 73 Quest Kickoff, 102-103 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Topic Launch: Human Impacts on the Environment>uConnect Lab: Finding a Solution for Your Pollution;>Quest Kickoff: Trash Backlash >Lesson 4: Water Pollution>Quest Check-In Lab: Reducing Waste
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.	**Changing Earth and Human Activity SE/TE:** Using Energy Resources, 64 Impact on the Earth System, 109 Acid Rain, 116 Wetlands, 129
• 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.	**Changing Earth and Human Activity SE/TE:** The Human Population, 105 Using Natural Resources, 108-109 Balancing Needs, 110
Science and Engineering Practices	
Constructing Explanations and Designing Solutions	
• Apply scientific principles to design an object, tool, process or system.	**Changing Earth and Human Activity SE/TE:** uEngineer It!, 73 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Topic Launch: Human Impacts on the Environment>uConnect Lab: Finding a Solution for Your Pollution >Lesson 4: Water Pollution>Quest Check-In Lab: Reducing Waste
Crosscutting Concepts	
Cause and Effect	
• Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.	**Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Topic Launch: Human Impacts on the Environment>uConnect Lab: Finding a Solution for Your Pollution

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Connections to Engineering, Technology, and Applications of Science	
Influence of Science, Engineering, and Technology 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 and over time.	**Changing Earth and Human Activity SE/TE:** Alternative Sources of Energy, 68-71 Lesson 2 Check, #4, 72 uEngineer It!, 73
Performance Expectation MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per- capita consumption of natural resources impact Earth's systems.	**Changing Earth and Human Activity SE/TE:** Connect It!, 104 The Human Population, 105 Using Natural Resources, 108-109 Topic 3 Evidence-Based Assessment, 148-149 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Lesson 1: Population Growth and Resource Consumption>Interactivity: Human Population Growth;>Worksheet: Human Population Growth;>uInvestigate Lab: Doubling Time
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.	**Changing Earth and Human Activity SE/TE:** The Human Population, 105 Using Natural Resources, 108-109 Balancing Needs, 110 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Lesson 1: Population Growth and Resource Consumption>uInvestigate Lab: Doubling Time
Science and Engineering Practices	
• Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	**Changing Earth and Human Activity SE/TE:** Reading Check, 110 Lesson 1 Check, #3, 111 Topic 3 Evidence-Based Assessment, #4, 148-149 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Lesson 1: Population Growth and Resource Consumption>Worksheet: Human Population Growth;>uInvestigate Lab: Doubling Time

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Crosscutting Concepts	
Cause and Effect	
• Cause and effect relationships may be used to predict phenomena in natural or designed systems.	**Changing Earth and Human Activity SE/TE:** Impact of Agriculture, 109 Topic 3 Review and Assess, #4, 146-147 Topic 3 Evidence-Based Assessment, #2, 148-149 **Realize™ Digital Resources:** **Changing Earth and Human Activity: Human Impacts on the Environment** >Lesson 1: Population Growth and Resource Consumption>Worksheet: Human Population Growth;>ulnvestigate Lab: Doubling Time
Connections to Engineering, Technology, and Applications of Science	
Influence of Science, Engineering, and Technology 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.	**Changing Earth and Human Activity SE/TE:** Using Energy Resources, 64 Humans and Minerals, 80 Human Impacts, 88-89 Using Natural Resources, 108-109 Outdoor Air Pollution, 114-116 Nutrient Depletion, 126 Wetlands, 129 Human Activities, 140-141
Connections to Nature of Science	
Science Addresses Questions About the Natural and Material World	
• Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.	**Changing Earth and Human Activity SE/TE:** Balancing Needs, 110

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Performance Expectation MS-PS1-2: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	**Structure and Properties of Matter SE/TE:** Physical Changes in Matter, 25-26 Chemical Changes in Matter, 27-28 **Atoms and Chemical Reactions SE/TE:** Changing Matter, 79-80 Evidence of Chemical Reactions, 82-83 Lesson 2 Check, #2, 88 Topic 2 Evidence-Based Assessment, 110-111 uDemonstrate Lab, 112-115 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 3: Changes in Matter>Inquiry Warm-Up Lab: Is a New Substance Formed?;>uInvestigate Lab: Physical and Chemical Changes;>Quest Check-In Lab: Cinematic Science **Atoms and Chemical Reactions: Chemical Reactions** >Topic Launch: Chemical Reactions>uConnect Lab: What Happens When Chemicals React? >Lesson 2: Chemical Change>Inquiry Warm-Up Lab: Presto Change-O!;>uInvestigate Lab: Changes in a Burning Candle
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.	**Structure and Properties of Matter SE/TE:** Matter, 5-7 Using Density, 20 Math Toolbox, 20 **Atoms and Chemical Reactions SE/TE:** Properties of Pure Substances, 101 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 2: Measuring Matter>uInvestigate Lab: Observing Physical Properties

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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.	**Structure and Properties of Matter SE/TE:** Chemical Changes in Matter, 27-28 Math Toolbox, 29 **Atoms and Chemical Reactions SE/TE:** Chemical Change, 80 Building and Breaking Chemical Bonds, 81 Evidence of Chemical Reactions, 82-83 Types of Chemical Reactions, 96
Science and Engineering Practices	
Analyzing and Interpreting Data	
• Analyze and interpret data to determine similarities and differences in findings.	**Atoms and Chemical Reactions SE/TE:** Lesson 2 Check, #2, 88 Topic 2 Evidence-Based Assessment, #4, 110-111 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 3: Changes in Matter>uInvestigate Lab: Physical and Chemical Changes;>Quest Check-In Lab: Cinematic Science **Atoms and Chemical Reactions: Chemical Reactions** >Topic Launch: Chemical Reactions>uConnect Lab: What Happens When Chemicals React? >Lesson 2: Chemical Change>Inquiry Warm-Up Lab: Presto Change-O!
Connections to Nature of Science	
Scientific Knowledge is Based on Empirical Evidence	
• Science knowledge is based upon logical and conceptual connections between evidence and explanations.	**Structure and Properties of Matter SE/TE:** Math Toolbox, 29 Lesson 3 Check, #2, 32 **Atoms and Chemical Reactions SE/TE:** Literacy Connection, 80 Topic 2 Evidence-Based Assessment, #4, 110-111 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 3: Changes in Matter>uInvestigate Lab: Physical and Chemical Changes;>Quest Check-In Lab: Cinematic Science A**toms and Chemical Reactions: Chemical Reactions** >Topic Launch: Chemical Reactions>uConnect Lab: What Happens When Chemicals React? >Lesson 2: Chemical Change>Inquiry Warm-Up Lab: Presto Change-O!;>uInvestigate Lab: Changes in a Burning Candle

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Crosscutting Concepts	
Patterns	
• Macroscopic patterns are related to the nature of microscopic and atomic- level structure.	**Atoms and Chemical Reactions SE/TE:** Building and Breaking Chemical Bonds, 81 uDemonstrate Lab, 112-115
Performance Expectation MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	**Structure and Properties of Matter SE/TE:** uEngineer It!, 55 **Earth Systems SE/TE:** uEngineer It!, 59 **Diversity of Life SE/TE:** uEngineer It!, 89 **Realize™ Digital Resources:** **Forces: Forces and Motion** >Lesson 1: Describing Motion and Force>Quest Check-In Interactivity: Define Criteria and Constraints **Changing Earth and Human Activity: Earth's Surface Systems** >Lesson 2: Erosion and Deposition>Quest Check-In Lab: Ingenious Island Part I **Systems, Reproduction, and Growth: Reproduction and Growth** >Lesson 4: Factors Influencing Growth>Quest Check-In Interactivity: Make Your Construction Case
Disciplinary Core Ideas	
ETS1.A: Defining and Delimiting Engineering Problems	
• 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 are likely to limit possible solutions.	**Structure and Properties of Matter SE/TE:** Define the Problem, 94-95

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Science and Engineering Practices	
Asking Questions and Defining Problems	
• Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.	**Structure and Properties of Matter SE/TE:** uEngineer It!, 55 **Earth Systems SE/TE:** uEngineer It!, 59 **Diversity of Life SE/TE:** uEngineer It!, 89 **Realize™ Digital Resources:** **Forces: Forces and Motion** >Lesson 1: Describing Motion and Force>Quest Check-In Interactivity: Define Criteria and Constraints **Changing Earth and Human Activity: Earth's Surface Systems** >Lesson 2: Erosion and Deposition>Quest Check-In Lab: Ingenious Island Part I **Systems, Reproduction, and Growth: Reproduction and Growth** >Lesson 4: Factors Influencing Growth>Quest Check-In Interactivity: Make Your Construction Case
Crosscutting Concepts	
Influence of Science, Engineering, and Technology 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.	**Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 135 **Changing Earth and Human Activity SE/TE:** Using Energy Resources, 64 uEngineer It!, 73 Humans and Minerals, 80 Human Impacts, 88-89 Using Natural Resources, 108-109 Wetlands, 129 Human Activities, 140-141

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• 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.	**Atoms and Chemical Reactions SE/TE:** uEngineer It!, 77 Impact of Synthetic Materials, 103-104 **Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 21 uEngineer It!, 135 **Earth Systems SE/TE:** uEngineer It!, 59 uEngineer It!, 131 **Realize™ Digital Resources:** **Earth Systems: Plate Tectonics** >Lesson 3: Earthquakes and Tsunami Hazards>Interactivity: Earthquake Engineering
Performance Expectation MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	**Energy Transfer SE/TE:** uEngineer It!, 21 **Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 21 **Systems, Reproduction, and Growth SE/TE:** uEngineer It!, 37 uEngineer It!, 123 **Relationships Within Ecosystems SE/TE:** uEngineer It!, 13 **Realize™ Digital Resources:** **Energy Transfer: Thermal Energy** >Lesson 3: Heat and Materials>Quest Check-In Lab: Keep the Heat In
Disciplinary Core Ideas	
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.	**Energy Transfer SE/TE:** Test and Evaluate a Solution, 98

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Science and Engineering Practices	
• Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	**Energy Transfer SE/TE:** uEngineer It!, 21 **Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 21 **Systems, Reproduction, and Growth SE/TE:** uEngineer It!, 37 uEngineer It!, 123 **Relationships Within Ecosystems SE/TE:** uEngineer It!, 13 **Realize™ Digital Resources:** **Energy Transfer: Thermal Energy** >Lesson 3: Heat and Materials>Quest Check-In Lab: Keep the Heat In
Unit 4: Energy and Waves	
Performance Expectation MS-PS2-3: Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.	**Forces SE/TE:** The Essential Question, 53 Electric Force, Fields, and Energy, 57-59 Magnetic Fields and Current, 76-77 Solenoids and Electromagnets, 78-79 Topic 2 Evidence-Based Assessment, 96-97 **Realize™ Digital Resources:** **Forces: Electricity and Magnetism** >Lesson 1: Electric Force>uInvestigate Lab: Detecting Charges >Lesson 4: Electric and Magnetic Interactions>Inquiry Warm-Up Lab: How Generators Work;>uInvestigate Lab: Electric Magnetic Motion
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.	**Forces SE/TE:** Electric Force, Fields, and Energy, 57-59 Magnetic Force and Energy, 67-68 Magnetic Fields and Current, 76-77 Solenoids and Electromagnets, 78-79
Science and Engineering Practices	
Asking Questions and Defining Problems	
• Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.	**Realize™ Digital Resources:** **Forces: Electricity and Magnetism** >Lesson 4: Electric and Magnetic Interactions>Inquiry Warm-Up Lab: How Generators Work;>uInvestigate Lab: Electric Magnetic Motion

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Crosscutting Concepts	
Cause and Effect	
• Cause and effect relationships may be used to predict phenomena in natural or designed systems.	**Forces SE/TE:** Reading Check, 77 Lesson 3 Check, #2, 80 Topic 2 Evidence-Based Assessment, #2, 96-97 **Realize™ Digital Resources:** **Forces: Electricity and Magnetism** >Lesson 1: Electric Force>ulnvestigate Lab: Detecting Charges >Lesson 4: Electric and Magnetic Interactions>ulnvestigate Lab: Electric Magnetic Motion
Performance Expectation MS-PS2-4: Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.	**Forces SE/TE:** Factors That Affect Gravity, 38-39 Literacy Connection, 39 Lesson 4 Check, #4, 42 **Realize™ Digital Resources:** **Forces: Forces and Motion** >Lesson 4: Friction and Gravitational Interactions>Enrichment: Gravitational Force of the Sun
Disciplinary Core Ideas	
PS2.B: Types of Interactions	
• Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.	**Forces SE/TE:** Universal Gravitation, 38 Factors Affecting Gravity, 39 Lesson 4 Check, #4, 42 **Realize™ Digital Resources:** **Forces: Forces and Motion** >Lesson 4: Friction and Gravitational Interactions>Enrichment: Gravitational Force of the Sun
Science and Engineering Practices	
Engaging in Argument from Evidence	
• Construct 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 or a solution to a problem.	**Forces SE/TE:** Literacy Connection, 39

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Connections to Nature of Science	
Scientific Knowledge is Based on Empirical Evidence	
• Science knowledge is based upon logical and conceptual connections between evidence and explanations.	**Forces SE/TE:** Literacy Connection, 39 **Realize™ Digital Resources:** **Forces: Forces and Motion** >Lesson 4: Friction and Gravitational Interactions>Enrichment: Gravitational Force of the Sun
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.	For related content, please see: **Forces SE/TE:** Model It!, 41
Performance Expectation MS-PS3-2: 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.	**Energy Transfer SE/TE:** Potential Energy, 17-19 **Forces SE/TE:** Energy, Forces, and Motion, 40-41 Model It!, 41 Charges and Potential Energy, 59 Question It!, 59 Potential Energy and Static Electricity, 63 Lesson 1 Check, #3, 64 Magnets and Potential Energy, 68 Potential Energy, 69 Topic 2 Review and Assess, #5, 94-95 Topic 2 Evidence-Based Assessment, 96-97 uDemonstrate Lab, 98-101 **Realize™ Digital Resources:** **Energy Transfer: Energy** >Lesson 2: Kinetic Energy and Potential Energy>uInvestigate Lab: Energy, Magnetism, and Electricity **Forces: Electricity and Magnetism** >Lesson 1: Electric Forces>Interactivity: Charged Interactions

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Disciplinary Core Ideas	
PS3.A: Definitions of Energy	
• A system of objects may also contain stored (potential) energy, depending on their relative positions.	**Energy Transfer SE/TE:** Potential Energy, 17-19 Comparing Thermal Energy, 58 **Forces SE/TE:** Energy, Forces, and Motion, 40-41 Model It!, 41 Charges and Potential Energy, 59 Question It!, 59 Potential Energy and Static Electricity, 63 Lesson 1 Check, #3, 64 Potential Energy, 69 Topic 2 Evidence-Based Assessment, 96-97 uDemonstrate Lab, 98-101
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.	**Energy Transfer SE/TE:** Work Related to Energy and Power, 10 Potential Energy, 17 Elastic Potential Energy, 19 **Forces SE/TE:** Charges and Potential Energy, 59 Question It!, 59 Electric Currents and Circuits, 60-61 Potential Energy and Static Electricity, 63 Magnets and Potential Energy, 68
Science and Engineering Practices	
• Develop a model to describe unobservable mechanisms.	**Forces SE/TE:** Model It!, 41 Balloon and Paper, 63 Potential Energy, 69 uDemonstrate Lab, 98-101 **Realize™ Digital Resources:** **Energy Transfer: Energy** >Lesson 2: Kinetic Energy and Potential Energy>uInvestigate Lab: Energy, Magnetism, and Electricity **Forces: Electricity and Magnetism** >Lesson 1: Electric Forces>Interactivity: Charged Interactions

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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.	**Forces SE/TE:** Model It!, 41 Balloon and Paper, 63 Potential Energy, 69 **Realize™ Digital Resources:** **Energy Transfer: Energy** >Lesson 2: Kinetic Energy and Potential Energy>uInvestigate Lab: Energy, Magnetism, and Electricity **Forces: Electricity and Magnetism** >Lesson 1: Electric Forces>Interactivity: Charged Interactions
Performance Expectation MS-PS3-5: 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.	**Energy Transfer SE/TE:** Energy Changes Form, 33-35 Energy Changes and the Law of Conservation, 36-38 Topic 1 Evidence-Based Assessment, 44-45 uDemonstrate Lab, 46-49 Temperature, Energy, and Friction, 76 **Realize™ Digital Resources:** **Energy Transfer: Energy** >Lesson 4: Energy Change and Conservation>uInvestigate Lab: Law of Conservation of Energy;>Interactivity: Take It to the Extreme;>Quest Check-In Lab: Redesign and Retest a Chain-Reaction Machine
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.	**Energy Transfer SE/TE:** Energy Changes Form, 33-35 Energy Changes and the Law of Conservation, 36-38 Lesson 4 Check, #4, 39 Temperature, Energy, and Friction, 76

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Science and Engineering Practices	
Engaging in Argument from Evidence	
• 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.	**Energy Transfer SE/TE:** uDemonstrate Lab, 46-49 **Realize™ Digital Resources:** **Energy Transfer: Energy** >Lesson 4: Energy Change and Conservation>uInvestigate Lab: Law of Conservation of Energy;>Interactivity: Take It to the Extreme;>Quest Check-In Lab: Redesign and Retest a Chain-Reaction Machine
Connections to Nature of Science	
Scientific Knowledge is Based on Empirical Evidence	
• Science knowledge is based upon logical and conceptual connections between evidence and explanations	**Energy Transfer SE/TE:** uDemonstrate Lab, 46-49 **Realize™ Digital Resources:** **Energy Transfer: Energy** >Lesson 4: Energy Change and Conservation>uInvestigate Lab: Law of Conservation of Energy;>Quest Check-In Lab: Redesign and Retest a Chain-Reaction Machine
Crosscutting Concepts	
Energy and Matter	
• Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).	**Energy Transfer SE/TE:** Determining Mechanical Energy, 23 More Forms of Energy, 24-27 Kinetic and Potential Energy, 34

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Performance Expectation MS-PS4-1: Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.	**Waves and Information Technologies SE/TE:** Types of Waves, 5-7 Properties of Waves, 8-9 Wave Energy, 10 Math Toolbox, 10 Lesson 1 Check, #4, 11 Topic 1 Evidence-Based Assessment, 56-57 **Realize™ Digital Resources:** **Waves and Information Technologies: Waves and Electromagnetic Radiation** >Lesson 1: Wave Properties>Interactivity: Modeling Waves;>uInvestigate Lab: Waves and Their Characteristics
Disciplinary Core Ideas	
PS4.A: Wave Properties	
• A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.	**Waves and Information Technologies SE/TE:** Properties of Waves, 8-9 Lesson 1 Check, #3, 11 **Realize™ Digital Resources:** **Waves and Information Technologies: Waves and Electromagnetic Radiation** >Lesson 1: Wave Properties>uInvestigate Lab: Waves and Their Characteristics
Science and Engineering Practices	
Using Mathematics and Computational Thinking	
• Use mathematical representations to describe and/or support scientific conclusions and design solutions.	**Waves and Information Technologies SE/TE:** Math Toolbox, 10 Lesson 1 Check, #4, 11 **Realize™ Digital Resources:** **Waves and Information Technologies: Waves and Electromagnetic Radiation** >Lesson 1: Wave Properties>uInvestigate Lab: Waves and Their Characteristics
Connections to Nature of Science	
Scientific Knowledge is Based on Empirical Evidence	
• Science knowledge is based upon logical and conceptual connections between evidence and explanations.	**Waves and Information Technologies SE/TE:** Math Toolbox, 10 **Realize™ Digital Resources:** **Waves and Information Technologies: Waves and Electromagnetic Radiation** >Lesson 1: Wave Properties>Interactivity: Modeling Waves;>uInvestigate Lab: Waves and Their Characteristics

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Crosscutting Concepts	
Patterns	
• Graphs and charts can be used to identify patterns in data.	**Realize™ Digital Resources:** **Waves and Information Technologies: Waves and Electromagnetic Radiation** >Lesson 1: Wave Properties>uInvestigate Lab: Waves and Their Characteristics
Performance Expectation MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	**Waves and Information Technologies SE/TE:** Reflection, Refraction, and Absorption, 15-17 Model It!, 16 The Behavior of Sound, 25-27 Model It!, 27 Light, Color, and Objects, 45-47 Reflecting Light, 48-50 Model It!, 50 Lenses, 51-52 Topic 1 Review and Assess, #18, 54-55 Topic 1 Evidence-Based Assessment, 56-57 **Realize™ Digital Resources:** **Waves and Information Technologies: Waves and Electromagnetic Radiation** >Lesson 3: Sound Waves>uInvestigate Lab: Understanding Sound >Lesson 5: Light>Interactivity: Describe the Behavior of Light;>uInvestigate Lab: Light Interacting With Matter
Disciplinary Core Ideas	
PS4.A: Wave Properties	
• A sound wave needs a medium through which it is transmitted.	**Waves and Information Technologies SE/TE:** Types of Waves, 5 The Behavior of Sound, 25
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.	**Waves and Information Technologies SE/TE:** Light, Color, and Objects, 45-47
• The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends.	**Waves and Information Technologies SE/TE:** Refraction, 16 Lesson 2 Check, #1, 22 Lenses, 51-52
• A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media.	**Waves and Information Technologies SE/TE:** Refraction, 16 Wave Model of Light, 36 The Color of Objects, 46

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• However, because light can travel through space, it cannot be a matter wave, like sound or water waves.	**Waves and Information Technologies SE/TE:** Characteristics of Electromagnetic Waves, 35
Science and Engineering Practices	
• Develop and use a model to describe phenomena.	**Waves and Information Technologies SE/TE:** Model It!, 16 Model It!, 27 Model It!, 50 Topic 1 Review and Assess, #18, 54-55 Topic 1 Evidence-Based Assessment, #3, 56-57 **Realize™ Digital Resources:** **Waves and Information Technologies: Waves and Electromagnetic Radiation** >Lesson 3: Sound Waves>uInvestigate Lab: Understanding Sound >Lesson 5: Light>Interactivity: Describe the Behavior of Light;>uInvestigate Lab: Light Interacting With Matter
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.	**Waves and Information Technologies SE/TE:** Topic 1 Evidence-Based Assessment, #3, #5, 56-57 **Realize™ Digital Resources:** **Waves and Information Technologies: Waves and Electromagnetic Radiation** >Lesson 3: Sound Waves>uInvestigate Lab: Understanding Sound >Lesson 5: Light>uInvestigate Lab: Light Interacting With Matter

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Performance Expectation MS-PS4-3: Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	**Waves and Information Technologies SE/TE:** The Essential Question, 63 Quest Kickoff, 64-65 Signals and Information, 77-79 Analog and Digital Signals, 80-82 Transmitting Signals, 83-84 Case Study: Super Ultra High Definition!, 86-87 Advantages of Digital Signals, 94-95 Lesson 3 Check, #4, 96 Topic 2 Review and Assess, #15, 98-99 Topic 2 Evidence-Based Assessment, 100-101 uDemonstrate Lab, 102-105 **Realize™ Digital Resources:** **Waves and Information Technologies: Information Technologies** >Topic Launch: Information Technologies>Quest Kickoff: Testing, Testing… 1, 2, 3 >Lesson 2: Signals>Interactivity: Analog and Digital Signals;>uInvestigate Lab: Constructing a Simple Computer Circuit >Lesson 3: Communication and Technology>uInvestigate Lab: Let the Music Play;>Interactivity: Signal Reliability;>Quest Check-In Interactivity: Evaluate Recording Technologies
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.	**Waves and Information Technologies SE/TE:** Advantages of Digital Signals, 94-95 Topic 2 Evidence-Based Assessment, 100-101 uDemonstrate Lab, 102-105 **Realize™ Digital Resources:** **Waves and Information Technologies: Information Technologies** >Lesson 3: Communication and Technology>uInvestigate Lab: Let the Music Play;>Interactivity: Signal Reliability

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Science and Engineering Practices	
Obtaining, Evaluating, and Communicating Information	
• Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.	**Waves and Information Technologies SE/TE:** Case Study: Super Ultra High Definition!, 86-87 Topic 2 Evidence-Based Assessment, 100-101 **Realize™ Digital Resources:** **Waves and Information Technologies: Information Technologies** >Lesson 2: Signals>ulnvestigate Lab: Constructing a Simple Computer Circuit >Lesson 3: Communication and Technology>ulnvestigate Lab: Let the Music Play;>Interactivity: Signal Reliability;>Quest Check-In Interactivity: Evaluate Recording Technologies
Crosscutting Concepts	
Structure and Function	
• Structures can be designed to serve particular functions.	**Realize™ Digital Resources:** **Waves and Information Technologies: Information Technologies** >Lesson 2: Signals>ulnvestigate Lab: Constructing a Simple Computer Circuit >Lesson 3: Communication and Technology>ulnvestigate Lab: Let the Music Play
Connections to Engineering, Technology, and Applications of Science	
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 and Information Technologies SE/TE:** Topic 2 Review and Assess, #14, 98-99
Connections to Nature of Science	
Science is a Human Endeavor	
• Advances in technology influence the progress of science and science has influenced advances in technology.	**Waves and Information Technologies SE/TE:** Signals and Information, 77-79 The Information Age, 89-90 Roger That!, 92-93 Extraordinary Science, 97

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Performance Expectation MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	**Structure and Properties of Matter SE/TE:** uEngineer It!, 55 **Earth Systems SE/TE:** uEngineer It!, 59 **Diversity of Life SE/TE:** uEngineer It!, 89 **Realize™ Digital Resources:** **Forces: Forces and Motion** >Lesson 1: Describing Motion and Force>Quest Check-In Interactivity: Define Criteria and Constraints **Changing Earth and Human Activity: Earth's Surface Systems** >Lesson 2: Erosion and Deposition>Quest Check-In Lab: Ingenious Island Part I **Systems, Reproduction, and Growth: Reproduction and Growth** >Lesson 4: Factors Influencing Growth>Quest Check-In Interactivity: Make Your Construction Case
Disciplinary Core Ideas	
ETS1.A: Defining and Delimiting Engineering Problems	
• 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 are likely to limit possible solutions.	**Structure and Properties of Matter SE/TE:** Define the Problem, 94-95
Science and Engineering Practices	
Asking Questions and Defining Problems	
• Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.	**Structure and Properties of Matter SE/TE:** uEngineer It!, 55 **Earth Systems SE/TE:** uEngineer It!, 59 **Diversity of Life SE/TE:** uEngineer It!, 89 **Realize™ Digital Resources:** **Forces: Forces and Motion** >Lesson 1: Describing Motion and Force>Quest Check-In Interactivity: Define Criteria and Constraints **Changing Earth and Human Activity: Earth's Surface Systems** >Lesson 2: Erosion and Deposition>Quest Check-In Lab: Ingenious Island Part I

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Continued:	**Realize™ continued:** **Systems, Reproduction, and Growth: Reproduction and Growth** >Lesson 4: Factors Influencing Growth>Quest Check-In Interactivity: Make Your Construction Case
Crosscutting Concepts	
Influence of Science, Engineering, and Technology 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.	**Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 135 **Changing Earth and Human Activity SE/TE:** Using Energy Resources, 64 uEngineer It!, 73 Humans and Minerals, 80 Human Impacts, 88-89 Using Natural Resources, 108-109 Wetlands, 129 Human Activities, 140-141
• 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.	**Atoms and Chemical Reactions SE/TE:** uEngineer It!, 77 Impact of Synthetic Materials, 103-104 **Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 21 uEngineer It!, 135 **Earth Systems SE/TE:** uEngineer It!, 59 uEngineer It!, 131 **Realize™ Digital Resources:** **Earth Systems: Plate Tectonics** >Lesson 3: Earthquakes and Tsunami Hazards>Interactivity: Earthquake Engineering

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Digital Resources: The symbol > indicates a click to reach each digital asset on the Realize platform.

Montgomery County Next Generation Science Curriculum, Grade 6	Elevate Science ©2019 Grades 6-8 Modules
Performance Expectation MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	**Energy Transfer SE/TE:** uEngineer It!, 21 **Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 21 **Systems, Reproduction, and Growth SE/TE:** uEngineer It!, 37 uEngineer It!, 123 **Relationships Within Ecosystems SE/TE:** uEngineer It!, 13 **Realize™ Digital Resources:** **Energy Transfer: Thermal Energy** >Lesson 3: Heat and Materials>Quest Check-In Lab: Keep the Heat In
Disciplinary Core Ideas	
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.	**Energy Transfer SE/TE:** Test and Evaluate a Solution, 98
Science and Engineering Practices	
• Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	**Energy Transfer SE/TE:** uEngineer It!, 21 **Cycles Influencing Weather and Climate SE/TE:** uEngineer It!, 21 **Systems, Reproduction, and Growth SE/TE:** uEngineer It!, 37 uEngineer It!, 123 **Relationships Within Ecosystems SE/TE:** uEngineer It!, 13 **Realize™ Digital Resources:** **Energy Transfer: Thermal Energy** >Lesson 3: Heat and Materials>Quest Check-In Lab: Keep the Heat In