The Alabama Science Course of Study Correlation to the STC Program and Building Blocks of Science

Alabama Scope and Sequence

	STC™ K-8	Building Blocks of Science® K-5
K	• *Exploring Forces and Motion* • *Exploring Plants and Animals* • *Exploring My Weather*	• *Push, Pull, Go* • *Discovering Animals* • *Weather and Sky*
1	• *Organisms*	• *Light and Sound Waves* • *Discovering Plants* • *Sky Watchers*
2	• *Solids and Liquids* • *Changes* • *Plant Growth and Development*	• *Ecosystem Diversity* • *Earth Materials* • *Matter*
3	• *Motion and Design* • *Weather* • *Life Cycle of Butterflies*	• *Forces and Interactions* • *Life in Ecosystems* • *Weather and Climate Patterns*
4	• *Electric Circuits* • *Animal Studies* • *Land and Water*	• *Energy Works* • *Plant and Animal Structures* • *Changing Earth*
5	• *Chemical Test* • *Ecosystems*	• *Structure and Properties of Matter* • *Matter and Energy in Ecosystems* • *Earth and Space Systems*
	STC™ for Middle School Grades 6-8	
6	• *Exploring Planetary Systems* • *Understanding Weather and Climate*	• *Researching the Sun-Earth-Moon System* • *Exploring Plate Tectonics*
7	• *Investigating Biodiversity and Interdependence* • *Exploring Respiration and Circulation*	• *Studying the Development and Reproduction of Organisms* • *Investigating Digestion and Motion*
8	• *Experimenting with Mixtures, Compounds and Elements* • *Experimenting with Forces and Motion*	• *Exploring the Properties of Matter* • *Electricity, Waves and Information Transfer*

To review resources digitally visit www.carolina.com/al

Click here to Preview Tigtag for K-5 **Click here to Preview Twig for Grades 6-8**

GRADES K–2
Overview

Science education in Grades K–2 provides students with a foundation for the lifelong pursuit of scientific information and exploration. Young children are natural scientists and possess a curiosity and eagerness to learn about the world around them. They are able to construct knowledge and gather information through the use of the five senses. Learning about science in the early years is a multifaceted task and requires a range of student experiences to support diverse learning styles.

The early childhood classroom environment must stimulate the natural curiosity and capitalize on the energy level of the young learner while providing a safe and supportive environment that appeals to all students. Key components of this educational environment include a meaningful curriculum, high–quality instruction, and effective assessment that drives instruction. The young student is a concrete learner in need of many opportunities to interact in hands-on, inquiry-based investigations and cooperative learning situations.

The K–2 science content creates a sound base for scientific exploration and acquisition of knowledge and skills in a developmentally appropriate manner. Effective science instruction in Grades K–2 includes instructional strategies guided by the content standards that address the three dimensions of scientific and engineering practices, crosscutting concepts, and disciplinary core ideas.

GRADE K

Kindergarten students enter school with an eagerness to explore the world around them. Although their experiences and background knowledge may be limited, science instruction provides ample opportunities to develop investigative thinking, argumentation, and reasoning in the context of familiar surroundings. Students develop the foundational skills necessary for future learning in science.

Students in kindergarten learn disciplinary core ideas from the three scientific domains of Physical, Life, and Earth and Space Sciences while demonstrating their learning in the context of the content standards for this grade level. In Physical Science, students investigate forces and interactions. In Life Science, students explore interactions, energy, and dynamics of ecosystems. In Earth and Space Science, students become familiar with Earth's systems while observing the effects of sunlight and studying weather patterns. The disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain are integrated within the content standards of the three scientific domains and are denoted with an asterisk (*).

Grade K content standards provide students with opportunities for appropriate investigation and observation of the world around them. Through guided participation in specific engineering design projects, they find answers regarding how to use force to change the speed or direction of an object, how to reduce the human impact on the local environment, how to reduce the effects of sunlight, and how to use weather forecasts to prepare for severe weather.

Students will:

Motion and Stability: Forces and Interactions	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
1. Investigate the resulting motion of objects when forces of different strengths and directions act upon them (e.g., object being pushed, object being pulled, two objects colliding).	**Push, Pull, Go** TG: Lesson 1 Part A–E pgs. 1– 10 Lesson 2 Part A pgs. 17–21 Lesson 3 part A–B pgs. 27–32 BB–*Push, Pull, Go* pgs. 4–9, 12–13	**Exploring Forces and Motion** TG: Lesson 1 pgs. 1–7, Lesson 2 pgs. 8–13 Lesson 3 pgs.14–21 Lesson 4 pgs. 22–27 BB–*Exploring Forces and Motion*
2. Use observations and data from investigations to determine if a design solution (e.g., designing a ramp to increase the speed of an object in order to move a stationary object) solves the problem of using force to change the speed or direction of an object.*	**Push, Pull, Go** TG: Lesson 1 Part A–E pgs. 1– 10 Lesson 2 Part A pgs. 17–21 Lesson 5 Part A–C pg. 45– 50 BB–*Push, Pull, Go* pgs. 8–9, 12–13	**Exploring Forces and Motion** TG: Lesson 5 pgs. 26–35 Lesson 6 pgs. 36–43 Lesson 7 pgs. 44–49 BB–*Exploring Forces and Motion*
Ecosystems: Interactions, Energy, and Dynamics	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
3. Distinguish between living and nonliving things and verify what living things need to survive (e.g., animals needing food, water, and air; plants needing nutrients, water, sunlight, and air).	**Discovering Animals** TG: Lesson 4 Part A pgs,39–41	**Exploring Plants and Animals** TG: Lesson 1 Part A–C pg.2–8 Lesson 2 Part C pgs.14–16 Lesson 4 Part A–B pgs. 26–29 BB–*Exploring Plant and Animals*

4. Gather evidence to support how plants and animals provide for their needs by altering their environment (e.g. tree roots breaking a sidewalk to provide space, red fox burrowing to create a den to raise young, humans growing gardens for food and building roads for transportation).	**Discovering Animals** TG: Lesson 3 Part A–B pgs. 25–30 Lesson 4 Part A–C pgs. 37–45 **Tigtag–Videos** *The Arctic Tundra Environment*	**Exploring Plants and Animals** TG: Lesson 5 pgs. Part A–C pgs. 34–40 BB–*Exploring Plant and Animals*
5. Construct a model of a natural habitat (e.g., terrarium, ant farm, and diorama) conducive to meeting the needs of plants and animals native to Alabama.	**Discovering Animals** TG: Lesson 3 Part A–B pgs. 25–30 Lesson 4 Part A–C pgs. 37–45 Lesson 5 Part A–C pgs. 51–59	**Exploring Plants and Animals** TG: Lesson 4 Part C pgs. 55–57 Lesson 5 Part A pgs. 66–69 Lesson 8 Part A–B pgs. 115–118 BB–*Exploring Plant and Animals*
6. Identify and plan possible solutions (e.g. reducing, reusing, recycling) to lessen the human impact on the local environment.*	**Tigtag–Videos** *The Three Rs*	**Exploring Plants and Animals** TG – Lesson 7 Part A–D pgs.95–106 BB–*Exploring Plant and Animals*
Earth's Systems	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
7. Observe and describe the effects of sunlight on Earth's surface (e.g., heat from the sun causing evaporation of water or increased temperature of soil, rocks, sand, and water).	**Weather and Sky** TG: Lesson 6 A–G pgs. 87–101	**Exploring My Weather** TG: Lesson 6 Part A–C pgs. 95–104 BB–*Exploring My Weather*
8. Design and construct a device (e.g., hat, canopy, umbrella, tent) to reduce the effects of sunlight.*	**Weather and Sky** TG: Lesson 4 A–C pgs. 55–63	**Exploring My Weather** TG: Lesson 7 Part B–C pgs.117–121 BB–*Exploring My Weather*
9. Observe, record, and share findings of local weather patterns over a period of time (e.g., increase in daily temperature from morning to afternoon, typical rain and storm patterns from season to season).	**Weather and Sky** TG: Lesson 2 A–E pgs. 15–25 BB–*Weather and Sky* pg. 10, 15	**Exploring My Weather** TG: Lesson 1 Part A–C pgs. 1–10 Lesson 2 Part A–C pgs. 19–31 Lesson 3 Part A–C pgs. 37–46 Lesson 4 Part A–C pgs.59–69 Lesson 5 Part A–C pgs. 79–90 BB–*Exploring My Weather*
Earth and Human Activity	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
10. Ask questions to obtain information about the purpose of weather forecasts in planning for, preparing for, and responding to severe weather.*	**Weather and Sky** TG: Lesson 2 Part E pgs. 24–25 Lesson 8 Part A–E pgs. 115–126	**Exploring My Weather** TG: Lesson 8 Part A–C pgs. 127–138 BB–*Exploring My Weather*

GRADE 1

First–grade students continue to be eager learners who are curious about their world. This inquisitive nature leads them to ask a variety of questions that deepen understanding. Students are developing social skills that enable them to interact in inquiry–based and cooperative–learning opportunities. Students begin to take ownership of their learning experiences by making connections through meaningful investigations.

Students in Grade 1 learn disciplinary core ideas from the three scientific domains of Physical, Life, and Earth and Space Sciences while demonstrating their learning in the context of the content standards for this grade level. In Physical Science, students conduct experiments to discover the properties of light and sound waves. In Life Science, students determine similarities between parents and their offspring and how organisms adapt to their environment. In Earth and Space Science, students continue to explore Earth's systems through observations of seasonal patterns as well as patterns in the day and night sky. The disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain are integrated within the content standards of the three science domains and are denoted with an asterisk (*).

Grade 1 content standards provide students with opportunities for appropriate investigation and observation of the world around them. Through guided participation in specific engineering design projects, they find answers regarding how to use light or sound to communicate and how humans can imitate plant or animal parts for survival or protection.

Students will:

Grade 1

Waves and Their Applications in Technologies for Information Transfer	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
1. Conduct experiments to provide evidence that vibrations of matter can create sound (e.g., striking a tuning fork, plucking a guitar string) and sound can make matter vibrate (e.g., holding a piece of paper near a sound system speaker, touching your throat while speaking).	**Light and Sound Waves** TG: Lesson 5 Part A–C pgs.61–68 Lesson 6 Part A–C pgs. 71–77 SR–*Light and Sound Waves* pgs.10–13	
2. Construct explanations from observations that objects can be seen only when light is available to illuminate them (e.g., moon being illuminated by the sun, colors and patterns in a kaleidoscope being illuminated when held toward a light).	**Light and Sound Waves** TG: Lesson 1 Part A–C pgs. 1–10 Lesson 3 Part A–C pgs. 27–39 Lesson 4 Part A–C pgs.59–69 SR–*Light and Sound Waves* pgs. 2–3	
3. Investigate materials to determine which types allow light to pass through (e.g., transparent materials such as clear plastic wrap), allow only partial light to pass through (e.g., translucent materials such as wax paper), block light (e.g., opaque materials such as construction paper), or reflect light (e.g., shiny materials such as aluminum	**Light and Sound Waves** TG: Lesson 2 Part A–B pgs. 11–19 Lesson 3 Part A–C pgs. 27–39 Lesson 4 Part A–C pgs. 47–57 SR–*Light and Sound Waves* pgs. 5–7	

foil).		
4. Design and construct a device that uses light or sound to send a communication signal over a distance (e.g., using a flashlight and a piece of cardboard to simulate a signal lamp for sending a coded message to a classmate, using a paper cup and string to simulate a telephone for talking to a classmate)*	**Light And Sound Waves** TG: Lesson 2 Extension pg.18 Lesson 3 Extension pg. 38 Lesson 6 Part B pgs.74–75 SR–*Light and Sound Waves* pg.14	
From Molecules to Organisms: Structures and Processes	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
5. Design a solution to a human problem by using materials to imitate how plants and/or animals use their external parts to help them survive, grow, and meet their needs (e.g., outerwear imitating animal furs for insulation, gear mimicking tree bark or shells for protection).*	**Discovering Plants** TG: Lesson 1 Part A–C pgs. 1–10 Lesson 2 Part A–C pgs. 19–31 Lesson 3 Part A–C pgs. 37–46 Lesson 4 Part A–C pgs.59–69 Lesson 5 Part A–C pgs. 79–90 SR–*Discovering Plants* pgs.2–3	
6. Obtain information to provide evidence that parents and their offspring engage in patterns of behavior that help the offspring survive (e.g., crying of offspring indicating need for feeding, quacking or barking by parents indicating protection of young).	**Discovering Plants** TG: Lesson 1 Part A–C pgs. 1–10 Lesson 2 Part A–C pgs. 19–31 Lesson 3 Part A–C pgs. 37–46 Lesson 4 Part A–C pgs.59–69 Lesson 5 Part A–C pgs. 79–90	**Organisms** TG: Lesson 11 pgs. 121–128 Lesson 12 pgs. 129–135 SR–*Organisms* pg. 8–9
Heredity: Inheritance and Variation of Traits	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
7. Make observations to identify the similarities and differences of offspring to their parents and to other members of the same species (e.g., flowers from the same kind of plant being the same shape, but differing in size; dog being same breed as parent, but differing in fur color or pattern).	**Discovering Plants** TG: Lesson 1 Part A–C pgs. 1–10 Lesson 2 Part A–C pgs. 19–31 Lesson 3 Part A–C pgs. 37–46 Lesson 4 Part A–C pgs.59–69 Lesson 5 Part A–C pgs. 79–90 SR–*Discovering Plants* pgs.8–13	**Organisms** TG: Lesson 2 pgs. 11–19 Lesson 4 pgs. 21–37 Lesson 7 pgs. 79–89 Lesson 8 pgs. 91–99 Lesson 9 pgs. 101–107 SR–*Organisms* pgs. 8–9,33
Earth's Place in the Universe	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
8. Observe, describe, and predict patterns of the sun, moon, and stars as they appear in the sky (e.g., sun and moon appearing to rise in one part of the sky, move across the sky, and set; stars other than our sun being visible at night, but not during the day).	**Sky Watchers** TG: Lesson 1 Part A–D pgs. 1–14 Lesson 2 Part A–B pgs. 15–24 Lesson 5 Part A–D pgs.57–78 Lesson 6 Part A–D pgs. 79–92 SR–*Sky Watchers* pgs. 2–3,10–13	
9. Observe seasonal patterns of sunrise and sunset to describe the relationship between the number of hours of daylight and the time of year (e.g., more hours of daylight during summer as compared to winter).	**Sky Watchers** TG: Lesson 2 Part A–B pgs. 15–24 Lesson 3 Part A–C pgs. 25–42 SR–*Sky Watchers* pgs.10–13	

GRADE 2

Second–grade students begin the school year with prior knowledge and skills that enable them to formulate answers to questions as they expand their comprehension of the world around them. Through continued exploration, they develop an understanding of the observable properties of materials and apply this understanding to the acquisition of new information and the construction of new models.

Students in Grade 2 learn disciplinary core ideas from the three scientific domains of Physical, Life, and Earth and Space Sciences while demonstrating their learning in the context of the content standards for this grade level. In Physical Science, students explore the physical properties and structure of matter. In Life Science, students explore plant needs and interactions within their habitats. In Earth and Space Science, students observe and identify Earth's events and physical features. The disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain are integrated within the content standards of the three scientific domains and are denoted with an asterisk (*).

Grade 2 content standards provide students with opportunities for appropriate exploration and observation of the world around them. Through guided participation in specific engineering design projects, they find answers regarding how properties of materials determine appropriate uses, how plants depend on animals for seed dispersal and pollination, and how to address changes caused by Earth events.

Students will:

Matter and Its Interactions	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
1. Conduct an investigation to describe and classify various substances according to physical properties (e.g., milk being a liquid, not clear in color, assuming shape of its container, mixing with water; mineral oil being a liquid, clear in color, taking shape of its container, floating in water; a brick being a solid, not clear in color, rough in texture, not taking the shape of its container, sinking in water).	**Matter** TG: Lesson 2 A–D pgs. 23–33	**Solids and Liquids** TG: Lesson 2 pgs. 11–17 Lesson 3 pgs. 20–23 Lesson 5 pgs. 42–45 Lesson 6 pgs. 48–52 Lesson 7 pgs. 56–60 Lesson 9 pgs.70–74 Lesson10 pgs. 79–84 Lesson 15 pgs. 117–121 Lesson16 pgs. 125–129 SR–*Solids and Liquids* pgs.2–7, 20–21
2. Collect and evaluate data to determine appropriate uses of materials based on their properties (e.g., strength, flexibility, hardness, texture, absorbency).*	**Tigtag–Videos** *Choosing Suitable Materials*	**Solids and Liquids** TG: Lesson 15 pgs. 117–121 Lesson16 pgs. 125–129 SR–*Solids and Liquids* pgs.4–11, 16–19
3. Demonstrate and explain how structures made from small pieces (e.g., linking cubes, blocks, building bricks, creative		**Changes** TG: Lesson 4 pgs. 43–51

construction toys) can be disassembled and then rearranged to make new and different structures.		
4. Provide evidence that some changes in matter caused by heating or cooling can be reversed (e.g., heating or freezing of water) and some changes are irreversible (e.g., baking a cake, boiling an egg).	**Matter** TG: Lesson 1 A–D pgs. 1–22 Lesson 3 A–D pgs. 43–58 Lesson 4 A–C pgs. 59–84 Lesson 5 A–B pgs. 85–110 **Tigtag–Videos** *Changing State* *Condensation and Freezing*	**Changes** TG: Lesson 2 pgs. 21—29 Lesson 3 pgs. 31–41 SR–*Changes* pgs.4–7
Ecosystems: Interactions, Energy, and Dynamics	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
5. Plan and carry out an investigation, using one variable at a time (e.g., water, light, soil, air), to determine the growth needs of plants.	**Ecosystem Diversity** TG: Lesson 2 Part A–C pgs. 15–24	**Plant Growth and Development** TG – Lesson 2 pgs. 11–19 Lesson 4 pgs. 21–37 Lesson 7 pgs. 79–89 Lesson 8 pgs. 91–99 Lesson 9 pgs. 101–107 SR–*Plant Growth and Development* pgs. 4–7
6. Design and construct models to simulate how animals disperse seeds or pollinate plants (e.g., animals brushing fur against seed pods and seeds falling off in other areas, birds and bees extracting nectar from flowers and transferring pollen from one plant to another).*	**Ecosystem Diversity** TG: Lesson 2 Part D pgs. 22–23	**Plant Growth and Development** TG: Lesson 2 pgs. 11–19 Lesson 4 pgs. 21–37 Lesson 7 pgs. 79–89 Lesson 8 pgs. 91–99 Lesson 9 pgs. 101–107 SR–*Plant Growth and Development* pgs. 39 – 82
7. Obtain information from literature and other media to illustrate that there are many different kinds of living things and that they exist in different places on land and in water (e.g., woodland,tundra, desert, rainforest, ocean, river).	**Ecosystem Diversity** TG: Lesson 3 Part A–C pgs.39–50 Lesson 4 Part A–C pgs. 61–71 Lesson 5 Part A–C pgs. 81–92 Lesson 8 Part A–B pgs.127 –133 SR–*Ecosystem Diversity* pgs. 2–13	SR–***Plant Growth and Development*** pgs. 9–11; 44–45; 56–59 **Tigtag–Videos** *What is a habitat?* *Life Underground* *The Arctic Tundra Environment* *In the Shadows of a Volcano* *Snub-nosed Monkey* *Plant Adaptations*
Earth's Systems	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
8. Make observations from media to obtain information about Earth events that happen over a short period of time (e.g., tornados, volcanic explosions, earthquakes) or over a time period longer than one can observe (e.g., erosion of rocks, melting of glaciers).	SR–*Earth Materials* pgs. 10–13 **Tigtag–Videos** *What Shapes the Coast*	
9. Create models to identify physical features of Earth (e.g., mountains, valleys, plains, deserts, lakes, rivers, oceans).	**Earth Materials** TG – Lesson 4 pgs. 39–47 Lesson 6 pgs. 63–68	

	SR–*Earth Materials* pgs. 8–9 **Tigtag–Videos** *What is a map?*	
10. Collect and evaluate data to identify water found on Earth and determine whether it is a solid or a liquid (e.g., glaciers as solid forms of water; oceans, lakes, rivers, streams as liquid forms of water).	**Earth Materials** TG: Lesson 4 pgs. 39–47 Lesson 6 pgs. 63–68 SR–*Earth Materials* pgs. 2–5 **Tigtag–Videos** *The Wonders of Water* *Glaciers* *Journey of a River*	
Earth and Human Activity	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
11. Examine and test solutions that address changes caused by Earth's events (e.g., dams for minimizing flooding, plants for controlling erosion).*		

GRADES 3–5
Overview

In Grades 3–5, students are introduced to disciplinary core ideas and crosscutting concepts in the domains of Physical Science; Life Science; Earth and Space Science; and Engineering, Technology, and Applications of Science through content and participation in scientific and engineering practices. Direct experiences with physical models and materials remain important as students develop their ability to reason and communicate in multimodal scientific contexts. Students in Grades 3–5 ask increasingly sophisticated questions that stem from their observations, experiences, and prior learning. While students engage in the practices of science and engineering, they revise and extend their understanding of the role of science in the natural and technological environments in which they live. Physical evidence derived from numeric measurements and recorded data becomes an important part of students' emerging scientific explanations.

Learning environments in Grades 3–5 encourage a full range of inquiry, including opportunities to carry out scientific investigations and engineering design projects related to the disciplinary core ideas. Students engage in written and oral communication about the texts they read, the phenomena they observe, and the conclusions they draw from their scientific investigations and engineering projects. The role of mathematics becomes increasingly important as students produce and present numerical data in various forms such as tables and graphs. Being engaged in learning environments where content knowledge and scientific and engineering practices are intertwined, helps students develop more scientifically accurate and coherent conceptions of the laws and principles that govern the physical world.

Effective science instruction in Grades 3–5 provides students with opportunities for a variety of scientific activities and scientific thinking. Classroom experiences include investigations that range from those structured by the teacher to those that emerge from students' own questions. Students have opportunities to decide which data to gather, the variables that should be controlled, and which tools and instruments are needed to carry out investigations. Through participation in scientific and engineering practices, students develop their abilities to work in groups to design solutions to problems stemming from real-world scientific scenarios. Domain-specific core ideas, crosscutting concepts, and performance expectations within the content standards create a framework for instructional planning and student learning.

GRADE 3

Grade 3 students are increasingly aware of their environment and have already discovered many patterns and processes in nature. Their capacity to process information is growing, making them eager to participate in scientific and engineering practices. Writing and mathematics skills are used when students communicate scientific information during varied instructional activities.

Students in Grade 3 learn disciplinary core ideas from the three scientific domains of Physical, Life, and Earth and Space Sciences while demonstrating their learning in the context of the content standards for this grade level. In Physical Science, students investigate, measure, and predict the motion of an object and test the cause–and–effect relationship of electric and magnetic interactions. In Life Science, students use evidence to interpret fossil data and construct explanations of an organism's ability to survive in different habitats. Students examine organisms' life cycles and traits and the influence of environment on these traits. In Earth and Space Science, students develop representations to describe weather and climate. The disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain are integrated within the content standards of the three scientific domains and are denoted with an asterisk (*).

Grade 3 content standards provide students with opportunities for investigation, observation, and interpretation of a variety of scientific phenomena. Through participation in specific engineering design challenges, they find solutions regarding how to use magnets to solve a simple design problem, how to solve problems created by environmental changes, and how to reduce the impact of weather–related hazards.

Students will:

Motion and Stability: Forces and Interactions	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
1. Plan and carry out an experiment to determine the effects of balanced and unbalanced forces on the motion of an object using one variable at a time, including number, size, direction, speed, position, friction, or air resistance (e.g., balanced forces pushing from both sides on an object, such as a box, producing no motion; unbalanced force on one side of an object, such as a ball, producing motion), and communicate these findings graphically.	**Forces and Interactions** TG: Lesson 1 pgs. 1–11 Lesson 2 pgs. 19–33 SR–*Forces and Interactions* pgs. 2–9	**Motion and Design** TG: Lesson 3 pgs. 29–37 Lesson 4 pgs. 39–49 Lesson 5 pgs. 51–59 Lesson 7 pgs. 68–75 Lesson 8 pgs.77–83 Lesson 9 pgs. 85–93 Lesson 10 pgs. 95–103 Lesson 11 pgs.105–111 Lesson 12 pgs.113–119 SR–*Motion and Design* pgs. 7–19
2. Investigate, measure, and communicate in a graphical format how an observed pattern of motion (e.g., a child swinging in a swing, a ball rolling back and forth in a bowl, two children teetering on a see–saw, a model vehicle rolling down a ramp of varying heights, a pendulum swinging) can be used to predict the future motion of an object.	**Forces and Interactions** TG: Lesson 4 pgs. 69–78 SR–*Forces and Interactions* pgs. 2–9	**Motion and Design** TG: Lesson 3 pgs. 29–37 Lesson 4 pgs. 39–49 Lesson 5 pgs. 51–59 Lesson 7 pgs. 68–75 Lesson 8 pgs.77–83 Lesson 9 pgs. 85–93 Lesson 10 pgs. 95–103 Lesson 11 pgs.105–111 Lesson 12 pgs.113–119 SR–Motion and Design. 20–48

3. Explore objects that can be manipulated in order to determine cause–and–effect relationships (e.g., distance between objects affecting strength of a force, orientation of magnets affecting direction of a magnetic force) of electric interactions between two objects not in contact with one another (e.g., force on hair from an electrically charged balloon, electrical forces between a charged rod and pieces of paper) or magnetic interactions between two objects not in contact with one another (e.g., force between two permanent magnets or between an electromagnet and steel paperclips, force exerted by one magnet versus the force exerted by two magnets).	**Forces and Interactions** TG: Lesson 3 pgs. 41–53 SR–*Forces and Interactions* pgs.10–11	**Motion and Design** TG: Lesson 3 pgs. 29–37 Lesson 4 pgs. 39–49 Lesson 5 pgs. 51–59 Lesson 7 pgs. 68–75 Lesson 8 pgs.77–83 Lesson 9 pgs. 85–93 Lesson 10 pgs. 95–103 Lesson 11 pgs.105–111 Lesson 12 pgs.113–119 SR–*Motion and Design* pgs.49–62
4. Apply scientific ideas about magnets to solve a problem through an engineering design project (e.g., constructing a latch to keep a door shut, creating a device to keep two moving objects from touching each other such as a maglev system).*	**Forces and Interactions** TG: Lesson 5 pgs.89–102 SR–*Forces and Interactions* pgs.12–14	**SR–*Motion and Design* pgs.49–62**
From Molecules to Organisms: Structures and Processes	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
5. Obtain and combine information to describe that organisms are classified as living things, rather than nonliving things, based on their ability to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.	SR– *Life in Ecosystems* pgs. 2–3	**Animal Studies** TG: Lesson 2 pgs. 11–20 SR–*Animal Studies* pgs. 6–21
6. Create representations to explain the unique and diverse life cycles of organisms other than humans (e.g., flowering plants, frogs, butterflies), including commonalities such as birth, growth, reproduction, and death.	**Tigtag–Videos** *Fairy Wasp* *Life Cycle of an oak Tree* *Poison Arrow Frog*	**Animal Studies** TG: Lesson 4 pgs. 39–50 Lesson 6 pgs. 69–78 Lesson 9 pgs. 99–106 **The Life Cycle of Butterflies** TG: Lesson 7 pgs. 41–46 Lesson 8 pgs.47–53 Lesson 9 pgs. 53–62 Lesson 13 pgs. 81–84 Lesson 14 pgs. 85–88 Lesson 15 pgs.89–94 Lesson 16 pgs.95–96
Heredity: Inheritance and Variation of Traits	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
7. Examine data to provide evidence that plants and animals, excluding humans, have traits inherited from parents and that variations of these traits exist in groups of similar organisms (e.g., flower colors in pea plants, fur color and pattern in animal offspring).	**Life in Ecosystems** TG: Lesson 1 Part A–C pgs. 1–9	**Animal Studies** TG: Lesson 11 pgs.113–120 SR–*Animal Studies* pgs. 6–21 **The Life Cycle of Butterflies** TG: Lesson 1 pgs. 3–10 Lesson 2 pgs.11–18 Lesson 3 pgs.19–22 Lesson 4 pgs. 23–28 Lesson 5 pgs. 29–34 Lesson 6 pgs. 35–40

		Lesson 10 pgs. 63–68 Lesson 11 pgs.69–76 Lesson 12 pgs. 77–80
8. Engage in argument from evidence to justify that traits can be influenced by the environment (e.g., stunted growth in normally tall plants due to insufficient water, change in an arctic fox's fur color due to light and/or temperature, stunted growth of a normally large animal due to malnourishment).	**Life in Ecosystems** TG: Lesson 3 Part A–C pgs.29–35	**Animal Studies** TG: Lesson 10 pgs.107–112 SR–*Animal Studies* pgs. 22–34 **The Life Cycle of Butterflies** TG: Lesson 12 pgs. 77–80
Unity and Diversity	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
9. Analyze and interpret data from fossils (e.g., type, size, distribution) to provide evidence of organisms and the environments in which they lived long ago (e.g., marine fossils on dry land, tropical plant fossils in arctic areas, fossils of extinct organisms in any environment).	**Life in Ecosystems** TG: Lesson 2 Part A–C pgs. 15–21 SR–*Life in Ecosystems* pgs. 2–5 **Tigtag–Videos** *Seashells on a Mountain* *Fossils* *Allosaurus*	
10. Investigate how variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing (e.g., plants having larger thorns being less likely to be eaten by predators, animals having better camouflage coloration being more likely to survive and bear offspring).	**Life in Ecosystems** Lesson 3 Part A–C pgs.29–35 Lesson 5 Part A–C pgs.53–60 SR–*Life in Ecosystems* pgs. 8–11	**Animal Studies** TG: Lesson 12 pgs. 121–132 Lesson 13 pgs.133–138 Lesson 14 pgs. 139–152 Lesson 15 pgs. 153–160 Lesson 16 pgs. 161–164 SR–*Animal Studies* pgs.22–34, 53–55 **The Life Cycle of Butterflies** TG: Lesson 13 pgs. 3–10 Lesson 14 Lesson 15 Lesson 16
11. Construct an argument from evidence to explain the likelihood of an organism's ability to survive when compared to the resources in a certain habitat (e.g. freshwater organisms survive well, less well, or not at all in saltwater; desert organisms survive well, less well, or not at all in woodlands). a. Construct explanations that forming groups helps some organisms survive. b. Create models that illustrate how organisms and their habitats make up a system in which the parts depend on each other. c. Categorize resources in various habitats as basic materials (e.g., sunlight, air, freshwater, soil), produced materials (e.g., food, fuel, shelter), or	**Life in Ecosystems** TG: Lesson 5 Part A–C pgs.53–60	**Animal Studies** TG: Lesson 1 pgs. 3–10 Lesson 2 pgs. 11–20 Lesson 3 pgs.21– 38 Lesson 5 pgs. 51–68 Lesson 10 pgs. 107–112 SR–*Animal Studies* pgs. 6–21, 30–32

as nonmaterial (e.g., safety, instinct, nature–learned behaviors).		
12. Evaluate engineered solutions to a problem created by environmental changes and any resulting impacts on the types and density of plant and animal populations living in the environment (e.g., replanting of sea oats in coastal areas due to destruction by hurricanes, creating property development restrictions in vacation areas to reduce displacement and loss of native animal populations).*	**Life in Ecosystems** TG: Lesson 5 Part A–C pgs. 53–60	**Animal Studies** TG: Lesson 12 pgs. 121–132 Lesson 13 pgs.133–138 Lesson 14 pgs. 139–152 Lesson 15 pgs. 153–160 Lesson 16 pgs. 161–164 SR–*Animal Studies* pgs. 50–62
Earth's Systems	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
13. Display data graphically and in tables to describe typical weather conditions expected during a particular season (e.g., average temperature, precipitation, wind direction).	**Weather and Climate Patterns** TG: Lesson 1 Part A–C pgs.1–8 Lesson 2 Part A–C pgs.15–23 SR–*Weather and Climate Patterns* pgs. 2–13	**Weather** TG: Lesson 1 pgs. 3–10 Lesson 2 pgs.11–19 Lesson 3 pgs.21–25 Lesson 4 pgs. 27–36 Lesson 5 pgs. 37–48 Lesson 6 pgs. 49–54 Lesson 7 pgs. 55–62 Lesson 8 pgs.63–72 Lesson 9 pgs. 73–80 SR–*Weather* pgs. 2–29
14. Collect information from a variety of sources to describe climates in different regions of the world.	**Weather and Climate Patterns** TG: Lesson 4 Part A–D pgs. 43–54 Lesson 5 Part A–E pgs.65– 77 SR–*Weather and Climate Patterns* pgs. 2–13	**Weather** TG: Lesson 5 pgs. 37–48 Lesson 6 pgs. 49–54 Lesson 7 pgs. 55–62 Lesson 8 pgs.63–72 Lesson 9 pgs. 73–80 Lesson 10 pgs. 81–90 Lesson 11pgs. 91–100 SR–*Weather* pgs. 2–29
Earth and Human Activity	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
15. Evaluate a design solution (e.g., flood barriers, wind resistant roofs, lightning rods) that reduces the impact of a weather-related hazard.*		

GRADE 4

Grade 4 students' view of the natural world includes many scientifically accurate components. They recognize the role of evidence in scientific thinking and are beginning to include evidence in their scientific explanations. Fourth graders enjoy an active learning environment with opportunities to manipulate physical materials and construct models.

Fourth–grade students learn disciplinary core ideas from the three scientific domains of Physical, Life, and Earth and Space Sciences while demonstrating their learning in the context of the content standards for this grade level. In Physical Science, students construct explanations based on evidence connecting the speed of an object to the energy of that object, including the transference of energy in its various forms. They obtain information about sources, uses, and environmental effects of renewable and nonrenewable energy resources. Additionally, fourth–grade students analyze wave patterns with observable wavelengths and amplitudes. In Life Science, students compare the internal and external structures of plants and animals, obtain and communicate information about human body systems, and investigate ways animals process information. In Earth and Space Science, Grade 4 students examine evidence to construct explanations for both slow and rapid changes on Earth's land features, describe patterns of Earth's land and water based on maps, and carry out investigations relating to erosion. The disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain are integrated within the content standards of the three scientific domains and are denoted with an asterisk (*).

Grade 4 content standards provide students with opportunities for investigation, observation, and explanation of a variety of scientific phenomena. Through participation in specific engineering design projects, they find answers regarding which components of a device change energy from one form to another, how wave patterns can be used to transfer information, and how to limit the effects of harmful natural Earth processes on human life.

Students will:

Energy	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
1. Use evidence to explain the relationship of the speed of an object to the energy of that object.	**Energy Works** TG: Lesson 2 Part A–B pgs.11–17 Lesson 3 part A–D pgs. 27–35 SR–*Energy Works* pgs. 2–13	
2. Plan and carry out investigations that explain transference of energy from place to place by sound, light, heat, and electric currents. a. Provide evidence that heat can be produced in many ways (e.g., rubbing hand, together, burning leaves) and can move from one object to another by conduction. b. Demonstrate that different objects can absorb reflect, and/or conduct energy. c. Demonstrate that electric circuits require a complete loop through which an electric current can pass.	**Energy Works** TG: Lesson 3 part A–D pgs. 27–35 SR–*Energy Works* pgs. 2–13	**Electric Circuits** TG: Lesson 1 pgs. 3–5 Lesson 2 pgs.7–14 Lesson 3 pgs.15–20 Lesson 4 pgs. 21–26 Lesson 5 pgs. 27–34 Lesson 6 pgs. 35–42 SR–*Electric Circuits* pgs. 7–21

3. Investigate to determine changes in energy resulting from increases or decreases in speed that occur when objects collide.	**Energy Works** TG: Lesson 2 Part A–B pgs.11–17 SR–*Energy Works* pgs.2–13	
4. Design, construct, and test a device that changes energy from one form to another (e.g., electric circuits converting electrical energy into motion, light, or sound energy; a passive solar heater converting light energy into heat energy).*	**Energy Works** TG: Lesson 3 part A–D pgs. 27–35\ Lesson 6 Part A–C pgs. 101–106 SR–*Energy Works* pgs. 2–13	**Electric Circuits** TG: Lesson 1 pgs. 3–5 Lesson 2 pgs.7–14 Lesson 3 pgs.15–20 Lesson 4 pgs. 21–26 Lesson 5 pgs. 27–34 Lesson 6 pgs. 35–42 SR–*Electric Circuits* pgs. 7–21
5. Compile information to describe how the use of energy derived from natural renewable and nonrenewable resources affects the environment (e.g., constructing dams to harness energy from water, a renewable resource, while causing a loss of animal habitats; burning of fossil fuels, a nonrenewable resource, while causing an increase in air pollution; installing solar panels to harness energy from the sun, a renewable resource, while requiring specialized materials that necessitate mining).	**Energy Works** TG: Lesson 4 Part A–D pgs.53–63 Lesson 5 part A–D pgs.77–84 SR–*Energy Works* pgs. 2–13 **Tigtag–Videos** *Fuels* *Non-renewable vs. Renewable* *Solar Power* *Energy Sources* *Nuclear Energy* *The Energy Debate* *Wind Turbines* *The Future of Energy* *The Carbon Family*	
Waves and Their Applications in Technologies for Information Transfer	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
6. Develop a model of waves to describe patterns in terms of amplitude and wavelength, and including that waves can cause objects to move.	**Energy Works** TG: Lesson 4 Part A–D pgs.53–63 SR–*Energy Works* pgs. 2–13	
7. Develop and use models to show multiple solutions in which patterns are used to transfer information (e.g., using a grid of 1s and 0s representing black and white to send information about a picture, using drums to send coded information through sound waves, using Morse code to send a message).*	**Energy Works** TG: Lesson 5 Extension "Going Digital" pg.63 SR–*Energy Works* pgs. 2–13	
8. Construct a model to explain that an object can be seen when light reflected from its surface enters the eyes.	**Tigtag–Videos** *Visible Light* *How We See, Part 1: Eyes*	
From Molecules to Organisms: Structures and Processes	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
9. Examine evidence to support an argument that the internal and external structures of plants (e.g., thorns, leaves, stems, roots, colored petals, xylem, phloem) and animals (e.g., heart, stomach, lung, brain, skin) function to support survival, growth, behavior, and reproduction.	**Plant and Animal Structures** TG: Lesson 1 Part A–C pgs.1–10 Lesson 2 Part A–C pgs. 17–23 Lesson 3 Part A–B pgs. 29–34 Lesson 4 Part A–C pgs. 37–44 Lesson 5 Part A–C pgs. 47–53 SR–*Plant and Animal Structures* pgs. 2–13	**Animal Studies** TG: Lesson 3 pgs. 21–38 Lesson 4 pgs. 39–50 Lesson 5 pgs. 51–68 Lesson 6 pgs. 69–78 Lesson 7 pgs. 79–90 Lesson 8 pgs. 91–98 Lesson 9 pgs. 99–106 Lesson 10 pgs. 107–112

		Lesson 11 pgs. 113–120 Lesson 12 pgs. 121–132 Lesson 13 pgs. 133–138 Lesson 14 pgs. 139–152 Lesson 15 pgs. 153–160 Lesson 16 pgs. 161–164 Lesson 17 pgs. 165–168
10. Obtain and communicate information explaining that humans have systems that interact with one another for digestion, respiration, circulation, excretion, movement, control, coordination, and protection from disease.	**Tigtag–Videos** *Body Systems* *The Cell* *The Spread of Disease* *The Common Cold*	**Animal Studies** TG: Lesson 3 pgs. 21–38 Lesson 4 pgs. 39–50 Lesson 5 pgs. 51–68 Lesson 6 pgs. 69–78 Lesson 7 pgs. 79–90 Lesson 8 pgs. 91–98 Lesson 9 pgs. 99–106 Lesson 10 pgs. 107–112 Lesson 11 pgs. 113–120 Lesson 12 pgs. 121–132 Lesson 13 pgs. 133–138 Lesson 14 pgs. 139–152 Lesson 15 pgs. 153–160 Lesson 16 pgs. 161–164 Lesson 17 pgs. 165–168
11. Investigate different ways animals receive information through the senses, process that information, and respond to it in different ways (e.g., skunks lifting tails and spraying an odor when threatened, dogs moving ears when reacting to sound, snakes coiling or striking when sensing vibrations).	**Plant and Animal Structures** TG: Lesson 1 Part A–C pgs.1–10 Lesson 2 Part A–C pgs. 17–23 Lesson 3 Part A–B pgs. 29–34 Lesson 4 Part A–C pgs. 37–44 Lesson 5 Part A–C pgs. 47–53 SR–*Plant and Animal Structures* pgs. 2–13	**Animal Studies** TG: Lesson 3 pgs. 21–38 Lesson 4 pgs. 39–50 Lesson 5 pgs. 51–68 Lesson 6 pgs. 69–78 Lesson 7 pgs. 79–90 Lesson 8 pgs. 91–98 Lesson 9 pgs. 99–106 Lesson 10 pgs. 107–112 Lesson 11 pgs. 113–120 Lesson 12 pgs. 121–132 Lesson 13 pgs. 133–138 Lesson 14 pgs. 139–152 Lesson 15 pgs. 153–160 Lesson 16 pgs. 161–164 Lesson 17 pgs. 165–168
Earth's Systems	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
12. Construct explanations by citing evidence found in patterns of rock formations and fossils in rock layers that Earth changes over time through both slow and rapid processes (e.g., rock layers containing shell fossils appearing above rock layers containing plant fossils and no shells indicating a change from land to water over time, a canyon with different rock layers in the walls and a river in the bottom indicating that over time a river cut through the rock).	**Changing Earth** TG: Lesson 5 Part A–C pgs. 56–62 SR–*Changing Earth* pgs. 2–21	
13. Plan and carry out investigations to examine properties of soils and soil types (e.g., color, texture, capacity to retain water, ability to support growth of plants).	**Tigtag–Videos** *In the Shadow of a Volcano* *What is Soil?*	
14. Explore information to support the claim that landforms are the result of a combination of constructive forces, including crustal deformation, volcanic eruptions, and sediment deposition as	**Changing Earth** TG: Lesson 4 Part A–C pgs.39–47	

well as a result of destructive forces, including erosion and weathering.	SR–*Changing Earth* pgs. 2–21	
15. Analyze and interpret data (e.g., angle of slope in downhill movement of water, volume of water flow, cycles of freezing and thawing of water, cycles of heating and cooling of water, speed of wind, relative rate of soil deposition, amount of vegetation) to determine effects of weathering and rate of erosion by water, ice, wind, and vegetation using one single form of weathering or erosion at a time.	**Changing Earth** TG: Lesson 2 Part A–B pgs. 11–17 Lesson 4 Part A–C pgs.39–47 SR–*Changing Earth* pgs. 2–21	
16. Describe patterns of Earth's features on land and in the ocean using data from maps (e.g., topographic maps of Earth's land and ocean floor; maps of locations of mountains, continental boundaries, volcanoes, and earthquakes).	**Changing Earth** TG: Lesson 2 Part A–B pgs. 11–17 Lesson 3 Part A–C pgs. 27–34 Lesson 4 Part A–C pgs.39–47 SR–*Changing Earth* pgs. 2–21	
17. Formulate and evaluate solutions to limit the effects of natural Earth processes on humans (e.g., designing earthquake, tornado, or hurricane–resistant buildings; improving monitoring of volcanic activity).*	**Tigtag–Videos** *The Drowning City*	

GRADE 5

Grade 5 students have developed many skills that enable them to conduct more refined measurements of data and communicate scientific information with greater detail through various forms of presentation. They are able to recognize the process needed for planning and carrying out investigations, relate numeric relationships to patterns discovered in data, and identify the role of design solutions to problems occurring in real life. Many fifth graders are emerging scientific thinkers. An encouraging and challenging learning environment can inspire fifth graders to develop a passion for science and engineering.

Fifth–grade students learn disciplinary core ideas from the three scientific domains of Physical, Life, and Earth and Space Sciences while demonstrating their learning in the context of the content standards for this grade level. In Physical Science, students classify matter based on its physical and chemical properties and carry out investigations to provide evidence of the principle of conservation of matter. In Life Science, they develop models to explain the flow of energy and matter in ecosystems, including classifying resources into living and nonliving and classifying organisms into producers, consumers, and decomposers. In Earth and Space Science, students use multiple ways to illustrate the distribution of water on Earth and the interaction of the atmosphere, biosphere, geosphere, and hydrosphere. Students obtain information about ways individuals and communities can protect Earth's resources and environment. Fifth graders find evidence of the gravitational force that pulls all objects downward, evaluate factors that cause some stars to shine more brightly than others, and construct explanations for the patterns of seasons, day and night, and the seasonal changes of stars visible in the sky. The disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain are integrated within the content standards of the three scientific domains and are denoted with an asterisk (*).

Grade 5 content standards provide students with opportunities for investigation, observation, and explanation of a variety of scientific phenomena. Through participation in specific engineering design projects, students find answers regarding which methods can be used to clean a polluted environment and how to modify the speed of a falling object due to gravity.

Students will:

Matter and Its Interactions	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
1. Plan and carry out investigations (e.g., adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, evaporating salt water) to provide evidence that matter is made of particles too small to be seen.	**Structure and Properties of Matter** TG: Lesson 4 Part A–C pgs.57–65 SR–*Structures and Properties of Matter* pgs. 2–4, 6	**Chemical Tests** TG: Lesson 1 pgs. 3–14 Lesson 4 pgs. 39–45 SR–*Chemical Tests* pgs. 7–14
2. Investigate matter to provide mathematical evidence, including graphs, to show that regardless of the type of reaction (e.g., new substance forming due to dissolving or mixing) or change (e.g., phase change) that occurs when heating, cooling, or mixing substances, the total weight of the matter is conserved.	**Structure and Properties of Matter** TG: Lesson 1 Part B –C pgs. 6–9 Lesson 4 Part A–C pgs.57–65 Lesson 5 Part A–B pgs. 81–87 SR–*Structure and Properties of Matter*	**Chemical Tests** TG: Lesson 7 pgs. 73–80 Lesson 8 pgs. 81–86 Lesson 9 pgs. 87–94 Lesson 10 pgs. 95–102 Lesson 11 pgs.103–108

	pgs. 18–21.	SR–*Chemical Tests* pgs. 14–22
3. Examine matter through observations and measurements to identify materials (e.g., powders, metals, minerals, liquids) based on their properties (e.g., color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, solubility, density).	**Structure and Properties of Matter** TG: Lesson 3 Part A –C pgs. 41–47 SR–*Structure and Properties of Matter* pgs. 8–20	**Chemical Tests** TG: Lesson 3 pgs. 25–38 Lesson 5 pgs. 49–60 Lesson 6 pgs. 61–72 Lesson 12 pgs. 109–116 Lesson 13 pgs.117–124 Lesson 14 pgs.125–134 Lesson 15 pgs. 136–144 Lesson 16 pgs. 149–156 SR–*Chemical Tests* pgs. 24–32
4. Investigate whether the mixing of two or more substances results in new substances (e.g., mixing of baking soda and vinegar resulting in the formation of a new substance, gas; mixing of sand and water resulting in no new substance being formed).	**Structure and Properties of Matter** TG: Lesson 3 Part A –C pgs. 41–47 Lesson 4 Part A–C pgs.57–65 SR–*Structure and Properties of Matter* pgs. 14–17	**Chemical Tests** TG: Lesson 3 pgs. 25–38 Lesson 5 pgs. 49–60 Lesson 6 pgs. 61–72 Lesson 12 pgs. 109–116 Lesson 13 pgs.117–124 Lesson 14 pgs.125–134 Lesson 15 pgs. 136–144 Lesson 16 pgs. 149–156 SR–*Chemical Test* pgs. 41–49
5. Construct explanations from observations to determine how the density of an object affects whether the object sinks or floats when placed in a liquid.	SR–*Structure and Properties of Matter* pgs. 11 **Tigtag–Videos** *Density*	
Motion and Stability: Forces and Interactions	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
6. Construct an explanation from evidence to illustrate that the gravitational force exerted by Earth on objects is directed downward towards the center of Earth.	**Earth and Space Systems** TG: Lesson 2, Part B pgs. 23–24 Lesson 4, Part B pgs. 67–68 **Tigtag–Videos** *What is Gravity?* *Gravity in Our Universe?*	
7. Design and conduct a test to modify the speed of a falling object due to gravity (e.g., constructing a parachute to keep an attached object from breaking).*		
Ecosystems: Interactions, Energy, and Dynamics	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
8. Defend the position that plants obtain materials needed for growth primarily from air and water.	**Matter and Energy in Ecosystems** TG: Lesson 2 Part A–C pgs. 31–41 SR–*Matter and Energy in Ecosystems* pgs. 2–5	**Ecosystems** TG: Lesson1 pgs.3–12 Lesson 2 pgs.13–24 Lesson 3 pgs. 35–37 Lesson 4 pgs. 39–54 Lesson 5 pgs. 55–62 Lesson 6 pgs.63–78 Lesson 7 pgs.79–88

9. Construct an illustration to explain how plants use light energy to convert carbon dioxide and water into a storable fuel, carbohydrates, and a waste product, oxygen, during the process of photosynthesis.	**Matter and Energy in Ecosystems** TG: Lesson 2 Part A–C pgs. 31–41 SR–*Matter and Energy in Ecosystems* pgs. 6–9	**Ecosystems** TG: Lesson1 pgs.3–12 Lesson 2 pgs.13–24 Lesson 3 pgs. 35–37 Lesson 4 pgs. 39–54 Lesson 5 pgs. 55–62 Lesson 6 pgs.63–78 Lesson 7 pgs.79–88
10. Construct and interpret models (e.g., diagrams, flow charts) to explain that energy in animals' food is used for body repair, growth, motion, and maintenance of body warmth and was once energy from the sun.	**Matter and Energy in Ecosystems** TG: Lesson 2 Part A–C pgs.31–41 Lesson 3 Part A–D pgs. 47–55 Lesson 4 Part A–C pgs. 63–71 SR–*Matter and Energy in Ecosystems* pgs. 10–17	
11. Create a model to illustrate the transfer of matter among producers; consumers, including scavengers and decomposers; and the environment.	**Matter and Energy in Ecosystems** TG: Lesson 2 Part A–C pgs.31–41 Lesson 3 Part A–D pgs. 47–55 Lesson 4 Part A–C pgs. 63–71 SR–*Matter and Energy in Ecosystems* pgs. 10–17.	**Ecosystems** TG: Lesson 7 pgs.79–88 SR–*Ecosystems* pgs. 11–16
Earth's Place in the Universe	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
12. Defend the claim that one factor determining the apparent brightness of the sun compared to other stars is the relative distance from Earth.	**Earth and Space Systems** TG: Lesson 1 Part B pgs. 5	
13. Analyze data and represent with graphs to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky (e.g., shadows and the position and motion of Earth with respect to the sun, visibility of select stars only in particular months).	**Earth and Space Systems** TG: Lesson 3 Part A–C pgs. 39–46 SR–*Earth and Space Systems* pgs. 4–5,	
Earth's Systems	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
14. Use a model to represent how any two systems, specifically the atmosphere, biosphere, geosphere, and/or hydrosphere, interact and support life (e.g., influence of the ocean on ecosystems, landform shape, and climate; influence of the atmosphere on landforms and ecosystems through weather and climate; influence of mountain ranges on winds and clouds in the atmosphere).	**Earth and Space Systems** TG: Lesson 4 Part A–B pgs. 63–68 SR–*Earth and Space Systems* pgs. 10–15.	**Land and Water** TG: Lesson 1 pgs. 3–12 Lesson 2 pgs. 13–32 Lesson 3 pgs. 33–40 Lesson 4 pgs. 41–54 Lesson 6 pgs. 65–71 Lesson 7 pgs. 72–90 Lesson 8 pgs. 91–104 Lesson 9 pgs. 105–114 Lesson 10 pgs. 115–124 Lesson 11 pgs. 125–132 Lesson 13 pgs. 149–158

15. Identify the distribution of freshwater and salt water on Earth (e.g., oceans, lakes, rivers, glaciers, ground water, polar ice caps) and construct a graphical representation depicting the amounts and percentages found in different reservoirs.	**Earth and Space Systems** TG: Lesson 5 Part A–C pgs. 79–86 SR–*Earth and Space Systems* pgs. 16–21	**Land and Water** TG: Lesson 1 pgs. 3–12 Lesson 2 pgs. 13–32
Earth and Human Activity	Building Blocks of Science® (BBS)	Science and Technology Concepts™ (STC)
16. Collect and organize scientific ideas that individuals and communities can use to protect Earth's natural resources and its environment (e.g., terracing land to prevent soil erosion, utilizing no–till farming to improve soil fertility, regulating emissions from factories and automobiles to reduce air pollution, recycling to reduce overuse of landfill areas).	**Tigtag–Videos** *Environmental Awareness and Care* *Future of Energy* *Human Impact on the Environment*	**Land and Water** TG: Lesson 12 pgs. 133–149 Lesson 13 pgs. 149–158 Lesson 14 pgs. 159–168 Lesson 15 pgs. 169–178 Lesson 16 pgs. 179–184 Lesson 17 pgs. 185–192
17. Design solutions, test, and revise a process for cleaning a polluted environment (e.g., simulating an oil spill in the ocean or a flood in a city and creating a solution for containment and/or cleanup).*	**Tigtag–Videos** *Polluting the Air* *Polluting the Land* *Polluting Our Water*	**Ecosystems** TG: Lesson 9 pgs.101–104 Lesson 10 pgs. 105–115 Lesson 11 pgs. 117–122 Lesson 12 pgs.123–130 Lesson 13 pgs. 131–138 Lesson 14 pgs. 139–152 Lesson 15 pgs. 153–172 Lesson 16 pgs. 173–176 *SR– Ecosystems* pgs. 11–16

GRADES 6–8
Overview

Students in Grades 6–8 develop independent, critical–thinking skills during a time when their bodies experience dramatic emotional changes and their minds shift from concrete to more conceptual thinking. Their curiosity, sense of purpose, and intellectual interests expand and mature. Middle school students are sensitive to peer perception and prefer interaction with peers during learning activities. Students possess multiple learning styles and a wide range of intellectual abilities. Teachers are challenged to incorporate effective instructional strategies using scientific, engineering, and technological practices that meet students' growing needs as individual learners while providing a safe, engaging learning environment.

Earth and Space Science, Life Science, and Physical Science content and skills are best taught through the integration of scientific and engineering practices, crosscutting concepts, and disciplinary core ideas. Students evaluate scientific evidence and engage in data–driven discussions about scientific concepts through peer review and independent verification. Precision and accuracy become more applicable to investigations as students use the International System of Units (SI) and dimensional analysis in their interpretation of empirical data. Students refine their understanding through comparisons, observations, and examinations of information gathered from experiences. By implementing a more rigorous, student–centered curriculum, science teachers enable students to become actively involved in their own learning.

Success in science creates independent, analytical, lifelong learners capable of meeting the needs and challenges of the twenty–first century. Students learn how scientific knowledge is acquired and how scientific explanations are developed. Through the engineering design process and the use of engineering, technology, and applications of science, students develop their abilities to work in cooperative groups to design solutions to problems encountered in the real world.

GRADE 6
Earth and Space Science

Grade 6 students are energetic and curious. They are maturing at a rapid rate and are in a transitional stage characterized by physical, social, and cognitive changes. The sixth–grade classroom environment addresses these changes by providing a balance between elementary and middle school practices. While these changes lead students toward emotional and academic independence, sixth graders continue to need guidance. They also need an environment that both supports and challenges them as they become more responsible.

Content standards challenge students to discover their world, their planet, and Earth's place in the universe. Students are provided opportunities to learn important scientific facts and to build conceptual understanding of scientific principles, laws, and theories. Students must understand and communicate scientific concepts in order to be scientifically literate. Inquiry–based instruction allows them to develop critical–thinking skills and problem–solving abilities needed in the field of science.

Grade 6 content focuses on the disciplinary core ideas in the Earth and Space Science domain. The first Earth and Space Science core idea, Earth's Place in the Universe, describes the universe as a whole and addresses its grand scale in both space and time. The second core idea, Earth's Systems, encompasses the processes that drive Earth's conditions and its continual change over time. The third core idea, Earth and Human Activity, addresses society's interactions with the planet. Integrated within the content standards are the disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain, which require students to employ tools and materials to solve problems and to use representations to convey various design solutions. ETS standards are denoted with an asterisk (*).

Students will:

Earth's Place in the Universe	Science and Technology Concepts™ (STC)
1. Create and manipulate models (e.g., physical, graphical, conceptual) to explain the occurrences of day/night cycles, length of year, seasons, tides, eclipses, and lunar phases based on patterns of the observed motions of celestial bodies.	**Exploring Planetary Systems** TG: Lesson 2 pgs. 21A–35 Lesson 3 pgs. 35A – 49 Lesson 4 pgs. 49A– 77 Lesson 5 pgs.77A–93 Lesson 6 pgs. 93A–121 Lesson 7 pgs.121A–155 **Researching Sun, Earth and Moon** TG: Lesson 3 pgs. 29A–51 Lesson 4 pgs. 51A–67 Lesson 7 pgs.103A–119
2. Construct models and use simulations (e.g., diagrams of the relationship between Earth and man– made satellites, rocket launch, International Space Station, elliptical orbits, black holes, life cycles of stars, orbital periods of objects within the solar system, astronomical units and light years) to explain the role of gravity in affecting the motions of celestial bodies within galaxies and the solar system (e.g., planets, moons, comets, asteroids, meteors).	**Exploring Planetary Systems** TG: Lesson 2 pgs. 21A–35 Lesson 3 pgs. 35A – 49 Lesson 4 pgs. 49A– 77 Lesson 5 pgs.77A–93 Lesson 6 pgs. 93A–121 Lesson 7 pgs.121A–155

	Researching Sun, Earth and Moon TG: Lesson 5 pgs. 67A–79
3. Develop and use models to determine scale properties of objects in the solar system (e.g., scale model representing sizes and distances of the sun, Earth, moon system based on a one–meter diameter sun).	**Exploring Planetary Systems** TG: Lesson 2 pgs. 21A–35 Lesson 3 pgs. 35A – 49 Lesson 4 pgs. 49A– 77 Lesson 5 pgs.77A–93 Lesson 6 pgs. 93A–121 Lesson 7 pgs.121A–155 **Researching Sun, Earth and Moon** TG: Lesson 1 pgs. 1A–13
Earth's Systems	Science and Technology Concepts™ (STC)
4. Construct explanations from geologic evidence (e.g., change or extinction of particular living organisms; field evidence or representations, including models of geologic cross–sections; sedimentary layering) to identify patterns of Earth's major historical events (e.g., formation of mountain chains and ocean basins, significant volcanic eruptions, fossilization, folding, faulting, igneous intrusion, erosion).	**Exploring Plate Tectonics** TG: Lesson 1 pgs. 1A–9 Lesson 6 pgs. 73A–89 Lesson 7 pgs. 89A–101 Lesson 8 pgs. 101A–111 Lesson 9 pgs. 111A–123 Lesson 10 pgs. 123A–139 Lesson 11 pgs. 139A–159 Lesson 12 pgs. 159A–173 Lesson 13 pgs. 173A–183 Lesson 14 pgs. 183A–207 Lesson 15 pgs.207A–211
5. Use evidence to explain how different geologic processes shape Earth's history over widely varying scales of space and time (e.g., chemical and physical erosion; tectonic plate processes; volcanic eruptions; meteor impacts; regional geographical features, including Alabama fault lines, Rickwood Caverns, and Wetumpka Impact Crater).	**Exploring Plate Tectonics** TG: Lesson 1 pgs. 1A–9 Lesson 6 pgs. 73A–89 Lesson 7 pgs. 89A–101 Lesson 8 pgs. 101A–111 Lesson 9 pgs. 111A–123 Lesson 10 pgs. 123A–139 Lesson 11 pgs. 139A–159 Lesson 12 pgs. 159A–173 Lesson 13 pgs. 173A–183 Lesson 14 pgs. 183A–207 Lesson 15 pgs.207A–211
6. Provide evidence from data of the distribution of fossils and rocks, continental shapes, and seafloor structures to explain past plate motions.	**Exploring Plate Tectonics** TG: Lesson 6 pgs. 73A–89 Lesson 7 pgs. 89A–101 Lesson 8 pgs. 101A–111 Lesson 9 pgs. 111A–123
7. Use models to construct explanations of the various biogeochemical cycles of Earth (e.g., water, carbon, nitrogen) and the flow of energy that drives these processes.	**Exploring Plate Tectonics** TG: Lesson 1 pgs. 1A–9 Lesson 2 pgs. 9A–23 Lesson 3 pgs. 23A–47 Lesson 4 pgs. 47A–65 Lesson 5 pgs. 65A–73 Lesson 6 pgs. 73A–89 Lesson 7 pgs. 89A–101 Lesson 8 pgs. 101A–111 Lesson 9 pgs. 111A–123

	Lesson 10 pgs. 123A–139 Lesson 11 pgs. 139A–159 Lesson 12 pgs. 159A–173 Lesson 13 pgs. 173A–183 Lesson 14 pgs. 183A–207 Lesson 15 pgs.207A–211
8. Plan and carry out investigations that demonstrate the chemical and physical processes that form rocks and cycle Earth materials (e.g., processes of crystallization, heating and cooling, weathering, deformation, and sedimentation).	**Exploring Plate Tectonics** TG: Lesson 1 pgs. 1A–9 Lesson 2 pgs. 9A–23 Lesson 3 pgs. 23A–47 Lesson 4 pgs. 47A–65 Lesson 5 pgs. 65A–73 Lesson 6 pgs. 73A–89 Lesson 7 pgs. 89A–101 Lesson 8 pgs. 101A–111 Lesson 9 pgs. 111A–123 Lesson 10 pgs. 123A–139 Lesson 11 pgs. 139A–159 Lesson 12 pgs. 159A–173 Lesson 13 pgs. 173A–183 Lesson 14 pgs. 183A–207 Lesson 15 pgs.207A–211
9. Use models to explain how the flow of Earth's internal energy drives a cycling of matter between Earth's surface and deep interior causing plate movements (e.g., mid–ocean ridges, ocean trenches, volcanoes, earthquakes, mountains, rift valleys, volcanic islands).	**Exploring Plate Tectonics** TG: Lesson 1 pgs. 1A–9 Lesson 2 pgs. 9A–23 Lesson 3 pgs. 23A–47 Lesson 4 pgs. 47A–65 Lesson 5 pgs. 65A–73 Lesson 6 pgs. 73A–89 Lesson 7 pgs. 89A–101 Lesson 8 pgs. 101A–111 Lesson 9 pgs. 111A–123 Lesson 10 pgs. 123A–139 Lesson 11 pgs. 139A–159 Lesson 12 pgs. 159A–173 Lesson 13 pgs. 173A–183 Lesson 14 pgs. 183A–207 Lesson 15 pgs.207A–211
10. Use research–based evidence to propose a scientific explanation regarding how the distribution of Earth's resources such as minerals, fossil fuels, and groundwater are the result of ongoing geoscience processes (e.g., past volcanic and hydrothermal activity, burial of organic sediments, active weathering of rock).	**Exploring Plate Tectonics** TG: Lesson 1 pgs. 1A–9 Lesson 2 pgs. 9A–23 Lesson 3 pgs. 23A–47 Lesson 4 pgs. 47A–65 Lesson 5 pgs. 65A–73 Lesson 6 pgs. 73A–89 Lesson 7 pgs. 89A–101 Lesson 8 pgs. 101A–111 Lesson 9 pgs. 111A–123 Lesson 10 pgs. 123A–139 Lesson 11 pgs. 139A–159 Lesson 12 pgs. 159A–173 Lesson 13 pgs. 173A–183 Lesson 14 pgs. 183A–207 Lesson 15 pgs.207A–211
11. Develop and use models of Earth's interior composition to illustrate the resulting magnetic field (e.g., magnetic poles) and to explain its measureable effects (e.g., protection from cosmic radiation).	**Exploring Plate Tectonics** TG: Lesson 5 pgs. 51A–69

	Researching the Sun–Earth–Moon System TG: Lesson 7 pgs.103A–119 Lesson 8 pgs. 119A–135 Lesson 9 pgs. 13A–157 **Experimenting with Forces and Motion** (8th Grade Unit) TG: Lesson 6 pgs. 51A–69
12. Integrate qualitative scientific and technical information (e.g., weather maps; diagrams; other visualizations, including radar and computer simulations) to support the claim that motions and complex interactions of air masses result in changes in weather conditions. a. Use various instruments (e.g., thermometers, barometers, anemometers, wet bulbs) to monitor local weather and examine weather patterns to predict various weather events, especially the impact of severe weather (e.g., fronts, hurricanes, tornados, blizzards, ice storms, droughts).	**Understanding Weather and Climate** TG: Lesson 2 pgs. 19A–37 Lesson 3 pgs. 37A–57 Lesson 4 pgs. 57A–73 Lesson 5 pgs.73A–93 Lesson 6 pgs. 93A–111 Lesson 7 pgs. 111A–131 Lesson 8 pgs. 131A–153 Lesson 9 pgs.153A–174
13. Use models (e.g., diagrams, maps, globes, digital representations) to explain how the rotation of Earth and unequal heating of its surface create patterns of atmospheric and oceanic circulation that determine regional climates. a. Use experiments to investigate how energy from the sun is distributed between Earth's surface and its atmosphere by convection and radiation (e.g., thermal energy transferring through a pan to its handle, warmer water in a pan rising as cooler water sinks).	**Understanding Weather and Climate** TG: Lesson 2 pgs. 19A–37 Lesson 3 pgs. 37A–57 Lesson 4 pgs. 57A–73 Lesson 5 pgs.73A–93 Lesson 6 pgs. 93A–111 Lesson 7 pgs. 111A–131 Lesson 8 pgs. 131A–153 Lesson 9 pgs.153A–174
14. Analyze and interpret data (e.g., tables, graphs, maps of global and regional temperatures; atmospheric levels of gases such as carbon dioxide and methane; rates of human activities) to describe how various human activities (e.g., use of fossil fuels, creation of urban heat islands, agricultural practices) and natural processes (e.g., solar radiation, greenhouse effect, volcanic activity) may cause changes in local and global temperatures over time.	**Exploring Plate Tectonics** TG: Lesson 10 pgs. 123A–139 **Understanding Weather and Climate** TG: Lesson 10 pgs. 133A–147 Lesson 11 pgs. 147A–209 Lesson 12 pgs. 209A–227
Earth and Human Activity	Science and Technology Concepts™ (STC)
15. Analyze evidence (e.g., databases on human populations, rates of consumption of food and other natural resources) to explain how changes in human population, per capita consumption of natural resources, and other human activities (e.g., land use, resource development, water and air pollution, urbanization) affect Earth's systems.	**Understanding Weather and Climate** TG: Lesson 10 pgs. 133A–147 Lesson 11 pgs. 147A–209 Lesson 12 pgs. 209A–227
16. Implement scientific principles to design processes for monitoring and minimizing human impact on the environment (e.g., water usage, including withdrawal of water from streams and aquifers or construction of dams and levees; land usage, including urban development, agriculture, o removal of wetlands; pollution of air, water, and land).*	**Understanding Weather and Climate** TG: Lesson 10 pgs. 133A–147 Lesson 11 pgs. 147A–209 Lesson 12 pgs. 209A–227

GRADE 7
Life Science

Seventh–grade students experience a wide range of physical and psychological changes during this stage of development where peer perception and social interactions play major roles in life and learning. As students mature and become more independent, their sense of curiosity and discovery must be fostered as they are encouraged to develop the self–discipline necessary for mastery of concepts at a higher level.

A variety of instructional strategies and techniques are essential for guiding students in Grade 7. Teachers must provide opportunities for students to communicate and interact with peers in a collaborative setting to develop explanations and design solutions to real–world problems using scientific concepts and processes. At this stage where learning progresses from concrete to abstract and from knowledge to applications in science, the method of cooperative learning provides an excellent strategy for instruction and a unique opportunity for teachers to capitalize on students' need for peer interaction.

Individual content standards are organized according to the disciplinary core ideas in the Life Science domain. The first Life Science core idea, From Molecules to Organisms: Structures and Processes, concentrates on the structure and function of cells and their connections to organs and organ systems. The second core idea, Ecosystems: Interactions, Energy, and Dynamics, investigates the interactions between living organisms and between biotic and abiotic factors. The third core idea, Heredity: Inheritance and Variation of Traits, centers on explaining genetic variations, describing the results of genetic mutations, and evaluating impacts of genetic technologies. The fourth core idea, Unity and Diversity, examines the patterns of change in populations of organisms over a long period of time and the relationship between natural selection and the reproduction and survival of a population. Integrated within the content standards are the disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain, which require students to employ tools and materials to solve problems and to use representations to convey various design solutions. ETS standards are denoted with an asterisk (*).

Students will:

From Molecules to Organisms: Structures and Processes	Science and Technology Concepts™ (STC)
1. Engage in argument from evidence to support claims of the cell theory.	**Investigating Biodiversity and Interdependence** TG: Lesson 5 pgs. 63A–79 Lesson 6 pgs. 79A–95 Lesson 7 pgs. 95A–113
2. Gather and synthesize information to explain how prokaryotic and eukaryotic cells differ in structure and function, including the methods of asexual and sexual reproduction.	**Investigating Biodiversity and Interdependence** TG: Lesson 6 pgs. 79A–95
3. Construct an explanation of the function (e.g., mitochondria releasing energy during cellular respiration) of specific cell structures (i.e., nucleus, cell membrane, cell wall, ribosomes, mitochondria, chloroplasts, and vacuoles) for maintaining a stable environment.	**Investigating Biodiversity and Interdependence** TG: Lesson 1 pgs. 1A–19 Lesson 2 pgs. 19A–39 Lesson 3 pgs. 39A–54 Lesson 4 pgs. 54A–63
4. Construct models and representations of organ systems (e.g., circulatory, digestive, respiratory, muscular, skeletal, nervous) to demonstrate how multiple interacting organs and systems work together to accomplish specific functions.	**Exploring Respiration and Circulation** TG: Lesson 1 pgs. 1-A–9 Lesson 2 pgs. 9-A–25 Lesson 3 pgs. 25-A–35

	Lesson 4 pgs. 35-A–55 Lesson 6 pgs. 67-A–77 Lesson 8 pgs. 89-A–107 Lesson 10 pgs. 119-A–131 **Investigating Digestion and Motion** TG: Lesson 1 pgs. 1-A–11 Lesson 2 pgs. 11-A–19 Lesson 6 pgs. 53-A–67 Lesson 7 pgs. 67-A–79 Lesson 10 pgs. 97-A–111 Lesson 11 pgs. 111A–127 Lesson 12 pgs. 127-A–137 **TWIG videos** Human Body
Ecosystems: Interactions, Energy, and Dynamics	Science and Technology Concepts™ (STC)
5. Examine the cycling of matter between abiotic and biotic parts of ecosystems to explain the flow of energy and the conservation of matter. a. Obtain, evaluate, and communicate information about how food is broken down through chemical reactions to create new molecules that support growth and/or release energy as it moves through an organism. b. Generate a scientific explanation based on evidence for the role of photosynthesis and cellular respiration in the cycling of matter and flow of energy into and out of organisms.	**Investigating Biodiversity and Interdependence** TG: Lesson 1 pgs. 1A–19 Lesson 2 pgs. 19A–39 Lesson 3 pgs. 39A–54 Lesson 4 pgs. 54A–63
6. Analyze and interpret data to provide evidence regarding how resource availability impacts individual organisms as well as populations of organisms within an ecosystem.	**Investigating Biodiversity and Interdependence** TG: Lesson 4 pgs. 54A–63 Lesson 7 pgs. 95A–113 Lesson 8 pgs. 113A–123 Lesson 9 pgs. 123A–133 Lesson 10 pgs. 133A–147 Lesson 11 pgs. 147A–154
7. Use empirical evidence from patterns and data to demonstrate how changes to physical or biological components of an ecosystem (e.g., deforestation, succession, drought, fire, disease human activities invasive species) can lead to shifts in populations.	**Investigating Biodiversity and Interdependence** TG: Lesson 4 pgs. 54A–63 Lesson 7 pgs. 95A–113 Lesson 8 pgs. 113A–123 Lesson 9 pgs. 123A–133 Lesson 10 pgs. 133A–147 Lesson 11 pgs. 147A–154
8. Construct an explanation to predict patterns of interactions in different ecosystems in terms of the relationships between and among organisms (e.g., competition, predation, mutualism, commensalism parasitism).	**Investigating Biodiversity and Interdependence** TG: Lesson 4 pgs. 54A–63 Lesson 7 pgs. 95A–113 Lesson 8 pgs. 113A–123 Lesson 9 pgs. 123A–133 Lesson 10 pgs. 133A–147 Lesson 11 pgs. 147A–154
9. Engage in argument to defend the effectiveness of a design solution that maintains biodiversity and ecosystem services (e.g., using scientific, economic, and social considerations regarding purifying water, recycling nutrients, preventing soil erosion).	**Investigating Biodiversity and Interdependence** TG: Lesson 4 pgs. 54A–63 Lesson 7 pgs. 95A–113 Lesson 8 pgs. 113A–123 Lesson 9 pgs. 123A–133 Lesson 10 pgs. 133A–147 Lesson 11 pgs. 147A–154 Lesson 12 pgs. 157A–164

10. Use evidence and scientific reasoning to explain how characteristic animal behaviors (e.g., building nests to protect young from cold, herding to protect young from predators, attracting mates for breeding by producing special sounds and displaying colorful plumage, transferring pollen or seeds, creating conditions for seed germination and growth) and specialized plant structures (e.g., flower brightness, nectar, and odor attracting birds that transfer pollen; hard outer shells on seeds providing protection prior to germination) affect the probability of successful reproduction of both animals and plants.	**Studying the Development and Reproduction of Organisms** TG: Lesson 6 pgs. 91A–108 Lesson 7 pgs. 109A–129 Lesson 8 pgs. 129A–143 Lesson 9 pgs. 143A–159 Lesson 10 pgs. 159A–180
11. Analyze and interpret data to predict how environmental conditions (e.g., weather, availability of nutrients, location) and genetic factors (e.g., selective breeding of cattle or crops) influence the growth of organisms (e.g., drought decreasing plant growth, adequate supply of nutrients for maintaining normal plant growth, identical plant seeds growing at different rates in different weather conditions, fish growing larger in large ponds than in small ponds).	**Studying the Development and Reproduction of Organisms** TG: Lesson 6 pgs. 91A–108 Lesson 7 pgs. 109A–129 Lesson 8 pgs. 129A–143 Lesson 9 pgs. 143A–159 Lesson 10 pgs. 159A–180
Heredity: Inheritance and Variation of Traits	Science and Technology Concepts™ (STC)
12. Construct and use models (e.g., monohybrid crosses using Punnett squares, diagrams, simulations) to explain that genetic variations between parent and offspring (e.g., different alleles, mutations) occur as a result of genetic differences in randomly inherited genes located on chromosomes and that additional variations may arise from alteration of genetic information.	**Studying the Development and Reproduction of Organisms** TG: Lesson 7 pgs. 109A–129
13. Construct an explanation from evidence to describe how genetic mutations result in harmful, beneficial, or neutral effects to the structure and function of an organism.	**Studying the Development and Reproduction of Organisms** TG: Lesson 5 pgs. 79A–91
14. Gather and synthesize information regarding the impact of technologies (e.g., hand pollination, selective breeding, genetic engineering, genetic modification, gene therapy) on the inheritance and/or appearance of desired traits in organisms.	**Studying the Development and Reproduction of Organisms** TG: Lesson 6 pgs. 91A–108 Lesson 7 pgs. 109A–129 Lesson 8 pgs. 129A–143 Lesson 9 pgs. 143A–159 Lesson 10 pgs. 159A–180
Unity and Diversity	Science and Technology Concepts™ (STC)
15. Analyze and interpret data for patterns of change in anatomical structures of organisms using the fossil record and the chronological order of fossil appearance in rock layers.	**Studying the Development and Reproduction of Organisms** TG: Lesson 1 pgs. 1A–19
16. Construct an explanation based on evidence (e.g., cladogram, phylogenetic tree) for the anatomical similarities and differences among modern organisms and between modern and fossil organisms, including living fossils (e.g., alligator, horseshoe crab, nautilus, coelacanth).	**Studying the Development and Reproduction of Organisms** TG: Lesson 7 pgs. 109A–129
17. Obtain and evaluate pictorial data to compare patterns in the embryological development across multiple species to identify relationships not evident in the adult anatomy.	**Studying the Development and Reproduction of Organisms** TG: Lesson 7 pgs. 109A–129
18. Construct an explanation from evidence that natural selection acting over generations may lead to the predominance of certain traits that support successful survival and reproduction of a population and to the suppression of other traits.	**Studying the Development and Reproduction of Organisms** TG: Lesson 6 pgs. 91A–108 Lesson 7 pgs. 109A–129 Lesson 8 pgs. 129A–143 Lesson 9 pgs. 143A–159 Lesson 10 pgs. 159A–180

GRADE 8
Physical Science

Students in eighth grade exhibit a wide range of learning styles and intellectual abilities. This diversity in development requires the implementation of a science curriculum that engages students in scientific inquiry. The classroom environment must provide opportunities for students to identify problems, ask questions, make observations, design solutions, and explore important scientific concepts through investigations. As students' curiosity and creativity flourish, teachers must design activities that encourage students to construct explanations based upon their own experiences and to use their creative abilities to devise solutions to real–world problems. Students engage in higher–level, abstract–thinking processes as they make connections between and among disciplines and become well–grounded in experiences. Students work in a variety of groups that foster collaboration among peers.

Grade 8 content standards are based upon the disciplinary core ideas in the Physical Science domain. The first core idea, Matter and Its Interactions, concentrates on the composition and properties of matter. The second core idea, Motion and Stability: Forces and Interactions, focuses on examining forces and predicting and developing explanations for changes in motion. The third core idea, Energy, involves the conservation of energy, energy transformations, and applications of energy to everyday life. The final core idea, Waves and Their Applications in Technologies for Information Transfer, examines types and properties of waves and the use of waves in communication devices. Integrated into the Physical Science content standards are the disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain, which require students to employ tools and materials to solve problems and to use representations to convey various design solutions. ETS standards are denoted with an asterisk (*).

Students will:

Matter and Its Interactions	Science and Technology Concepts™ (STC)
1. Analyze patterns within the periodic table to construct models (e.g., molecular–level models, including drawings; computer representations) that illustrate the structure, composition, and characteristics of atoms and simple and complex molecules.	**Experimenting with Mixtures, Compounds and Elements** TG: Lesson 7 pgs. 77A–87
2. Plan and carry out investigations to generate evidence supporting the claim that one pure substance can be distinguished from another based on characteristic properties.	**Experimenting with Mixtures, Compounds and Elements** TG: Lesson 1 pgs. 1A–12 Lesson 2 pgs. 13C–18 Lesson 3 pgs. 21A–30 Lesson 4 pgs. 31A–39 Lesson 5 pgs. 41A–56 Lesson 6 pgs. 57A–75 Lesson 7 pgs. 77A–87 Lesson 8 pgs. 89A–100 Lesson 9 pgs.101A–114 Lesson 10 pgs.119A–134 Lesson 11 pgs. 135A–142 Lesson 12 pgs. 145A–152
3. Construct explanations based on evidence from investigations to differentiate among compounds, mixtures, and solutions. a. Collect and analyze information to illustrate how synthetic materials (e.g., medicine, food additives, alternative fuels, and plastics) are derived from	**Experimenting with Mixtures, Compounds and Elements** TG: Lesson 1 pgs. 1A–12 Lesson 2 pgs. 13C–18 Lesson 3 pgs. 21A–30 Lesson 4 pgs. 31A–39

natural resources and how they impact society.	Lesson 5 pgs. 41A–56 Lesson 6 pgs. 57A–75 Lesson 7 pgs. 77A–87 Lesson 8 pgs. 89A–100 Lesson 9 pgs.101A–114 Lesson 10 pgs.119A–134 Lesson 11 pgs. 135A–142 Lesson 12 pgs. 145A–152
4. Design and conduct an experiment to determine changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	**Experimenting with Mixtures, Compounds and Elements** TG: Lesson 10 pgs.119A–134 Lesson 11 pgs. 135A–142 Lesson 12 pgs. 145A–152 **Exploring the Properties of Matter** TG: Lesson 6 pgs.73A–80 Lesson 7 pgs. 83A–96 Lesson 8 pgs. 99A–105
5. Observe and analyze characteristic properties of substances (e.g., odor, density, solubility, flammability, melting point, boiling point) before and after the substances combine to determine if a chemical reaction has occurred.	**Experimenting with Mixtures, Compounds and Elements** TG: Lesson 10 pgs.119A–134 Lesson 11 pgs. 135A–142 Lesson 12 pgs. 145A–152
6. Create a model, diagram, or digital simulation to describe conservation of matter and mass in a chemical reaction and explain the resulting differences between products and reactants.	**Experimenting with Mixtures, Compounds and Elements** TG: Lesson 1 pgs. 1A–12 Lesson 2 pgs. 13C–18 Lesson 3 pgs. 21A–30 Lesson 4 pgs. 31A–39 Lesson 5 pgs. 41A–56 Lesson 6 pgs. 57A–75 Lesson 7 pgs. 77A–87 Lesson 8 pgs. 89A–100 Lesson 9 pgs.101A–114 Lesson 10 pgs.119A–134 Lesson 11 pgs. 135A–142 Lesson 12 pgs. 145A–152
7. Design, construct, and test a device (e.g., glow stick, hand warmer, hot or cold pack, thermal wrap) that either releases or absorbs thermal energy by chemical reactions (e.g., dissolving ammonium chloride or calcium chloride in water) and modify the device as needed based on criteria (e.g., amount/concentration, time, temperature).*	**Experimenting with Mixtures, Compounds and Elements** TG: Lesson 9 pgs.101A–114 Lesson 10 pgs.119A–134 Lesson 11 pgs. 135A–142 **Exploring the Properties of Matter** TG: Lesson 9 pgs. 107A–120
Motion and Stability: Forces and Interactions	Science and Technology Concepts™ (STC)
8. Use Newton's first law to demonstrate and explain that an object is either at rest or moves at a constant velocity unless acted upon by an external force (e.g., model car on a table remaining motionless until pushed).	**Experimenting with Forces and Motion** TG: Lesson 7 pgs. 69A–81 Lesson 8 pgs. 83A–90 Lesson 9 pgs. 93A–106 Lesson 10 pgs. 107A–116 Lesson 11 pgs. 119A–123 Lesson 12 pgs.133A–142 Lesson 13 pgs.145A–150
9. Use Newton's second law to demonstrate and explain how changes in an object's motion depend on the sum of the forces on the object and the mass of the object (e.g., billiard balls moving when hit with a cue stick).	**Experimenting with Forces and Motion** TG: Lesson 1 pgs. 1A–9 Lesson 2 pgs.11A–18 Lesson 3 pgs. 19A–26

	Lesson 4 pgs.27A–40 Lesson 5 pgs. 41A–50 Lesson 6 pgs. 51A–67
10. Use Newton's third law to design a model to demonstrate and explain the resulting motion of two colliding objects (e.g., two cars bumping into each other, a hammer hitting a nail).*	**Experimenting with Forces and Motion** TG: Lesson 10 pgs. 107A–116 Lesson 11 pgs. 119A–123 Lesson 12 pgs.133A–142 Lesson 13 pgs.145A–150
11. Plan and carry out investigations to evaluate how various factors (e.g., electric force produced between two charged objects at different distances; magnetic force produced by an electromagnet with varying number of wire turns, varying number or size of dry cells, and varying size of iron core) affect the strength of electric and magnetic forces.	**Experimenting with Forces and Motion** TG: Lesson 1 pgs. 1A–9 Lesson 2 pgs.11A–18 Lesson 3 pgs. 19A–26 Lesson 4 pgs.27A–40 Lesson 5 pgs. 41A–50 Lesson 6 pgs. 51A–67 Lesson 12 pgs.133A–142 Lesson 13 pgs.145A–150
12. Construct an argument from evidence explaining that fields exist between objects exerting forces on each other (e.g., interactions of magnets, electrically charged strips of tape, electrically charged pith balls, gravitational pull of the moon creating tides) even when the objects are not in contact.	**Experimenting with Forces and Motion** TG: Lesson 5 pgs. 41A–50 Lesson 6 pgs. 51A–67
Energy	Science and Technology Concepts™ (STC)
13. Create and analyze graphical displays of data to illustrate the relationships of kinetic energy to the mass and speed of an object (e.g., riding a bicycle at different speeds, hitting a table tennis ball versus a golf ball, rolling similar toy cars with different masses down an incline).	**Experimenting with Forces and Motion** TG: Lesson 7 pgs. 69A–81 Lesson 8 pgs. 83A–90 Lesson 9 pgs. 93A–106 Lesson 10 pgs. 107A–116 Lesson 11 pgs. 119A–123 Lesson 12 pgs.133A–142 Lesson 13 pgs.145A–150
14. Use models to construct an explanation of how a system of objects may contain varying types and amounts of potential energy (e.g., observing the movement of a roller coaster cart at various inclines, changing the tension in a rubber band, varying the number of batteries in a series, observing a balloon with static electrical charge being brought closer to a classmate's hair).	**Experimenting with Forces and Motion** TG: Lesson 7 pgs. 69A–81 Lesson 8 pgs. 83A–90 Lesson 9 pgs. 93A–106 Lesson 10 pgs. 107A–116 Lesson 11 pgs. 119A–123 Lesson 12 pgs.133A–142 Lesson 13 pgs.145A–150
15. Analyze and interpret data from experiments to determine how various factors affect energy transfer as measured by temperature (e.g., comparing final water temperatures after different masses of ice melt in the same volume of water with the same initial temperature, observing the temperature change of samples of different materials with the same mass and the same material with different masses when adding a specific amount of energy).	**Experimenting with Mixtures, Compounds and Elements** TG: Lesson 8 pgs. 89A–100 Lesson 9 pgs.101A–114
16. Apply the law of conservation of energy to develop arguments supporting the claim that when the kinetic energy of an object changes, energy is transferred to or from the object (e.g., bowling ball hitting pins, brakes being applied to a car).	**Experimenting with Mixtures, Compounds and Elements** TG: Lesson 8 pgs. 89-A–100 Lesson 9 pgs.101-A–114

Waves and Their Applications in Technologies for Information Transfer	Science and Technology Concepts™ (STC)
17. Create and manipulate a model of a simple wave to predict and describe the relationships between wave properties (e.g., frequency, amplitude wavelength) and energy. a. Analyze and interpret data to illustrate an electromagnetic spectrum.	**Electricity, Waves, and Information Transfer** TG: Lesson 5 pgs. 79c–95b Lesson 6 pgs. 95c–114b Lesson 7 pgs. 114c–131b Lesson 8 pgs. 149c–167b Lesson 9 pgs.167c–185b Lesson 10 pgs.18c–199b Lesson 11 pgs. 199c–215b Lesson 12 pgs. 215c–229b Assessment 229c–235
18. Use models to demonstrate how light and sound waves differ in how they are absorbed, reflected, and transmitted through different types of media.	**Electricity, Waves, and Information Transfer** TG: Lesson 5 pgs. 79c–95b Lesson 6 pgs. 95c–114b Lesson 7 pgs. 114c–131b Lesson 8 pgs. 149c–167b Lesson 9 pgs.167c–185b Lesson 10 pgs.18c–199b Lesson 11 pgs. 199c–215b Lesson 12 pgs. 215c–229b Assessment 229c–235
19. Integrate qualitative information to explain that common communication devices (e.g., cellular telephones, radios, remote controls, Wi–Fi components, global positioning systems [GPS], wireless technology components) use electromagnetic waves to encode and transmit information.	**Electricity, Waves, and Information Transfer** TG: Lesson 5 pgs. 79c–95b Lesson 6 pgs. 95c–114b Lesson 7 pgs. 114c–131b Lesson 8 pgs. 149c–167b Lesson 9 pgs.167c–185b Lesson 10 pgs.18c–199b Lesson 11 pgs. 199c–215b Lesson 12 pgs. 215c–229b Assessment 229c–235