Science at Stratton School

Introduction:

Students in pre kindergarten through fifth grade begin to develop an understanding of the four disciplinary core ideas: physical sciences; life sciences; earth and space sciences; and engineering, technology, and applications of science. In the earlier grades, students begin by recognizing patterns and formulating answers to questions about the world around them. By the end of fifth grade, students are able to demonstrate grade-appropriate proficiency in gathering, describing, and using information about the natural and designed world(s). The performance expectations in elementary school grade bands develop ideas and skills that will allow students to explain more complex phenomena in the four disciplines as they progress to middle school and high school. While the performance expectations shown in kindergarten through fifth grade couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

21st Century Skills:

21st Century skills are 12 abilities that today's students need to succeed in their careers during the Information Age.

21st Century skills are:
Critical thinking
Creativity
Collaboration
Communication
Information literacy
Media literacy
Technology literacy
Flexibility
Leadership
Initiative
Productivity
Social skills

Next Generation Science Standards:

KINDERGARTEN

- K.Forces and Interactions: Pushes and Pulls
- K.Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment
- K.Weather and Climate
- K-2.Engineering Design

FIRST GRADE

- 1.Waves: Light and Sound
- 1.Structure, Function, and Information Processing
- 1.Space Systems: Patterns and Cycles
- K-2.Engineering Design

SECOND GRADE

- 2.Structure and Properties of Matter
- 2.Interdependent Relationships in Ecosystems
- 2.Earth's Systems: Processes that Shape the Earth
- K-2.Engineering Design

THIRD GRADE

- 3.Forces and Interactions
- 3.Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms
- 3.Inheritance and Variation of Traits: Life Cycles and Traits
- 3.Weather and Climate
- 3-5.Engineering Design

FOURTH GRADE

- 4.Energy
- 4.Waves
- 4.Structure, Function, and Information Processing
- 4.Earth's Systems: Processes that Shape the Earth
- 3-5.Engineering Design

FIFTH GRADE

- 5.Structure and Properties of Matter
- 5.Matter and Energy in Organisms and Ecosystems
- 5.Earth’s Systems
- 5.Space Systems: Stars and the Solar System
- 3-5.Engineering Design
- MS.Structure and Properties of Matter
- MS.Chemical Reactions
- MS.Forces and Interactions
- MS.Energy
- MS.Waves and Electromagnetic Radiation

LIFE SCIENCE

- MS.Structure, Function, and Information Processing
- MS.Matter and Energy in Organisms and Ecosystems
- MS.Interdependent Relationships in Ecosystems
- MS.Growth, Development, and Reproduction of Organisms
- MS.Natural Selection and Adaptations

EARTH AND SPACE SCIENCES

MS.Space Systems

MS.History of Earth

MS.Earth's Systems

MS.Weather and Climate

MS.Human Impacts

ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE

MS.Engineering Design

Earth Science

	K-2	3-5	6-8
ESS1.A The universe and its stars	Patterns of movement of the sun, moon, and stars as seen from Earth can be observed, described, and predicted.	Stars range greatly in size and distance from Earth and this can explain their relative brightness.	
			The solar system is part of the Milky Way, which is one of many billions of galaxies.
ESS1.B Earth and the solar system		The Earth's orbit and rotation,and the orbit of the moon around the Earth cause observable patterns.	The solar system contains many varied objects held together by gravity. Solar system models explain and predict eclipses, lunar phases, and seasons.
ESS1.C The history of planet Earth	Some events on Earth occur very quickly; others can occur very slowly.	Certain features on Earth can be used to order events that have occurred in a landscape.	Rock strata and the fossil record can be used as evidence to organize the relative occurrence of major historical events in Earth's history.

ESS2.A Earth materials and systems	Wind and water change the shape of the land.	Four major Earth systems interact. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms, and gravity break rocks, soils, and sediments into smaller pieces and move them around.	Energy flows and matter cycles within and among Earth's systems, including the sun and Earth's interior as primary energy sources. Plate tectonics is one result of these processes.
ESS2.B Plate tectonics and large-scale system interactions	Maps show where things are located. One can map the shapes and kinds of land and water in any area.	Earth's physical features occur in patterns, as do earthquakes and volcanoes. Maps can be used to locate features and determine patterns in those events.	Plate tectonics is the unifying theory that explains movements of rocks atEarth's surface and geological history.Maps are used to display evidence of plate movement.
ESS2.C The roles of water inEarth's surface processes	Water is found in many types of places and in different forms on Earth.	Most of Earth's water is in the ocean and much of the Earth's fresh water is in glaciers or underground.	Water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity. Density variations of sea water drive interconnected ocean currents. Water movement causes weathering and erosion, changing landscape features. --- ------ Complex interactions determine local weather patterns and influence climate, including the role of the ocean.
ESS2.D Weather and climate	Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time.	Climate describes patterns of typical weather conditions over different scales and variations. Historical weather patterns can be analyzed.	
ESS2.E Biogeology	Plants and animals can change their local environment. --- - Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.	Living things can affect the physical characteristics of their environment.	[Content found in LS4.A and LS4.D]
ESS3.A Natural resources		Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable over time, others are not.	Humans depend on Earth's land, ocean,atmosphere, and biosphere for different resources, many of which are limited or not renewable. Resources are distributed unevenly around the planet as a result of past geologic processes.

ESS3.B Natural hazards	In a region, some kinds of severe weather are more likely than others. Forecasts allow communities to prepare for severe weather.	A variety of hazards result from natural processes; humans cannot eliminate hazards but can reduce their impacts.	Mapping the history of natural hazards in a region and understanding related geological forces.
ESS3.C Human impacts on Earth systems	Things people do can affect the environment but they can make choices to reduce their impacts.	Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments.	Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impacts for different living things. Activities and technologies can be engineered to reduce people's impacts on Earth.
ESS3.D Global climate change	N/A	N/A	Human activities affect global warming. Decisions to reduce the impact of global warming depend on understanding climate science, engineering capabilities, and social dynamics.

Life Science

	K-2	3-5	6-8
LS1.A Structure and function	All organisms have external parts that they use to perform daily functions.	Organisms have both internal and external macroscopic structures that allow for growth, survival, behavior, and reproduction.	All living things are made up of cells. In organisms, cells work together to form tissues and organs that are specialized for particular body functions.
LS1.B Growth and development of organisms	Parents and offspring often engage in behaviors that help the offspring survive.	Reproduction is essential to every kind of organism. Organisms have unique and diverse life cycles.	Animals engage in behaviors that increase the odds of reproduction. An organism's growth is affected by both genetic and environmental factors.

LS1.C Organization for matter and energy flow in organisms	Animals obtain food they need from plants or other animals. Plants need water and light.	Food provides animals with the materials and energy they need for body repair, growth, warmth, and motion. Plants acquire material for growth chiefly from air, water, and process matter and obtain energy from sunlight, which is used to maintain conditions necessary for survival.	Plants use the energy from light to make sugars through photosynthesis. Within individual organisms, food is broken down through a series of chemical reactions that rearrange molecules and release energy.
LS1.D Information Processing	Animals sense and communicate information and respond to inputs with behaviors that help them grow and survive.	Different sense receptors are specialized for particular kinds of information; Animals use their perceptions and memories to guide their actions.	Each sense receptor responds to different inputs, transmitting them as signals that travel along nerve cells to the brain; The signals are then processed in the brain, resulting in immediate behavior or memories.
LS2.A Interdependent relationships in ecosystems	Plants depend on water and light to grow, and also depend on animals for pollination or to move their seeds around.	The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil.	Organisms and populations are dependent on their environmental interactions both with other living things and with nonliving factors, any of which can limit their growth. Competitive, predatory, and mutually beneficial interactions vary across ecosystems but the patterns are shared.
LS2.B Cycles of matter and energy transfer in ecosystems	[Content found in LS1.C and ESS3.A]	Matter cycles between the air and soil and among organisms as they live and die.	The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. Food webs model how matter and energy are transferred among producers, consumers, and decomposers as the three groups interact within an ecosystem.
LS2.C Ecosystem dynamics, functioning, and resilience	N/A	When the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed	Ecosystem characteristics vary over time. Disruptions to any part of an ecosystem can lead to shifts in all of its populations. The completeness or integrity of an ecosystem's biodiversity is often

		environment, and some die.	used as a measure of its health.
LS2.D Social interactions and group behavior	N/A	Being part of a group helps animals obtain food, defend themselves, and cope with changes.	N/A
LS3.A Inheritance of traits	Young organisms are very much, but not exactly, like their parents and also resemble other organisms of the same kind.	Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops.	Genes chiefly regulate a specific protein, which affect an individual's traits.
LS3.B Variation of traits			In sexual reproduction, each parent contributes half of the genes acquired by the offspring resulting in variation between parent and offspring. Genetic information can be altered because of mutations, which may result in beneficial, negative, or no change to proteins in or traits of an organism.
LS4.A Evidence of common ancestry and diversity	N/A	Some living organisms resemble organisms that once lived on Earth. Fossils provide evidence about the types of organisms and environments that existed long ago.	The fossil record documents the existence, diversity, extinction, and change of many life forms and their environments throughEarth's history. The fossil record and comparisons of anatomical similarities between organisms enables the inference of lines of evolutionary descent.
LS4.B Natural selection	N/A	Differences in characteristics between individuals of the same species provide advantages in surviving and reproducing.	Both natural and artificial selection result from certain traits giving some individuals an advantage in surviving and reproducing, leading to predominance of certain traits in a population.
LS4.C Adaptation	N/A	Particular organisms can only survive in particular environments. ---------- Populations of organisms live in a variety of habitats. Change in those habitats affects the organisms living	Species can change over time in response to changes in environmental conditions through adaptation by natural selection acting over generations. Traits that support successful survival and reproduction in the new environment become more common.

LS4.D Biodiversity and humans	A range of different organisms lives in different places.	there.	Changes in biodiversity can influence humans' resources and ecosystem services they rely on.

Physical Science

	K-2	3-5	6-8
PS1.A Structure of matter (includes PS1.C Nuclear processes)	Matter exists as different substances that have observable different properties. Different properties are suited to different purposes. Objects can be built up from smaller parts.	Matter exists as particles that are too small to see, and therefore matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.	The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter.
PS1.B Chemical reactions	Heating and cooling substances cause changes that are sometimes reversible and sometimes not.	Chemical reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.	Reacting substances rearrange to form different molecules, but the number of atoms is conserved. Some reactions release energy and others absorb energy.
PS2.A Forces and motion	Pushes and pulls can have different strengths and directions, and can change the speed or direction of its motion or start or stop it.	The effect of unbalanced forces on an object results in a change of motion. Patterns of motion can be used to predict future motion. Some forces act through contact, some forces act even when the objects are not in contact. The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.	The role of the mass of an object must be qualitatively accounted for in any change of motion due to the application of a force.
PS2.B Types of interactions			Forces that act at a distance involve fields that can be mapped by their relative strength and effect on an object.
PS2.C Stability & instability in physical systems	N/A	N/A	N/A

PS3.A Definitions of energy	N/A	Moving objects contain energy. The faster the object moves, the more energy it has. Energy can be moved from place to place by moving objects, or through sound, light, or electrical currents. Energy can be converted from one form to another form.	Kinetic energy can be distinguished from the various forms of potential energy. Energy changes to and from each type can be tracked through physical or chemical interactions. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter.
PS3.B Conservation of energy and energy transfer	[Content found in PS3.D]		
PS3.C Relationship between energy and forces	Bigger pushes and pulls cause bigger changes in an object's motion or shape.	When objects collide, contact forces transfer energy so as to change the objects' motions.	When two objects interact, each one exerts a force on the other, and these forces can transfer energy between them.
PS3.D Energy in chemical processes and everyday life	Sunlight warmsEarth's surface.	Energy can be "produced," "used," or "released" by converting stored energy. Plants capture energy from sunlight, which can later be used as fuel or food.	Sunlight is captured by plants and used in a reaction to produce sugar molecules, which can be reversed by burning those molecules to release energy.
PS4.A Wave properties	Sound can make matter vibrate, and vibrating matter can make sound.	Waves are regular patterns of motion, which can be made in water by disturbing the surface. Waves of the same type can differ in amplitude and wavelength. Waves can make objects move.	A simple wave model has a repeating pattern with a specific wavelength, frequency, and amplitude, and mechanical waves need a medium through which they are transmitted. This model can explain many phenomena including sound and light. Waves can transmit energy.
PS4.B Electromagnetic radiation	Objects can be seen only when light is available to illuminate them.	Object can be seen when light reflected from their surface enters our eyes.	The construct of a wave is used to model how light interacts with objects.
PS4.C Information technologies and instrumentation	People use devices to send and receive information.	---------- Patterns can encode, send, receive and decode information.	Waves can be used to transmit digital information. Digitized information is comprised of a pattern of 1s and 0s.