Correlation of
Seeds of Science/Roots of Reading®
Integrated Science and Literacy Units

Planets & Moons
Aquatic Ecosystems
Models of Matter
Chemical Changes

with National Science Education Standards for Grades K-4

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Correlation of *Seeds/Roots* 2nd/3rd grade units to the National Science Education Standards (K-4)

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES K-4 — SCIENCE AS INQUIRY				
UNDERSTANDINGS ABOUT SCIENTIFIC INQUIRY				
Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.	● ● ●	● ● ●	● ● ●	● ● ●
Scientists use different kinds of investigations depending on the questions they are trying to answer. Types of investigations include describing objects, events, and organisms; classifying them; and doing a fair test (experimenting).	● ●	● ●	● ●	● ● ●
Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists obtain using only their senses.	● ●	●	● ●	● ●
Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations.	● ● ●	● ● ●	● ● ●	● ● ●
Scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigations.	● ● ●	● ● ●	● ● ●	● ● ●
Scientists review and ask questions about the results of other scientists' work.	● ● ●	● ●	● ●	● ● ●

● ● ●=*Major focus on concept, skill, or understanding, explicitly taught*
● ●=*Moderate focus on concept, skill, or understanding with explicit teaching or practice*
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	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES K-4 — PHYSICAL SCIENCE (continued)				
PROPERTIES OF OBJECTS AND MATERIALS (continued)				
Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers.	•	••	••	•••
Objects are made of one or more materials, such as paper, wood, and metal. Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.			•••	••
Materials can exist in different states--solid, liquid, and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling.		•	•••	•
POSITION AND MOTION OF OBJECTS				
The position of an object can be described by locating it relative to another object or the background.				
An object's motion can be described by tracing and measuring its position over time.				
The position and motion of objects can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull.				
Sound is produced by vibrating objects. The pitch of the sound can be varied by changing the rate of vibration.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES K-4 — PHYSICAL SCIENCE (continued)				
LIGHT, HEAT, ELECTRICITY, AND MAGNETISM				
Light travels in a straight line until it strikes an object. Light can be reflected by a mirror, refracted by a lens, or absorbed by the object.				
Heat can be produced in many ways, such as burning, rubbing, or mixing one substance with another. Heat can move from one object to another by conduction.			••	•
Electricity in circuits can produce light, heat, sound, and magnetic effects.				
Electrical circuits require a complete loop through which an electrical current can pass.				
Magnets attract and repel each other and certain kinds of other materials.				
GRADES K-4 — LIFE SCIENCE				
THE CHARACTERISTICS OF ORGANISMS				
Organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.	•••			

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES K-4 — LIFE SCIENCE (continued)				
THE CHARACTERISTICS OF ORGANISMS (continued)				
Each plant or animal has different structures that serve different functions in growth, survival, and reproduction. For example, humans have distinct body structures for walking, holding, seeing, and talking.	● ●			
The behavior of individual organisms is influenced by internal cues (such as hunger) and by external cues (such as a change in the environment). Humans and other organisms have senses that help them detect internal and external cues.	● ●			
LIFE CYCLES OF ORGANISMS				
Plants and animals have life cycles that include being born, developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.	● ●			
Plants and animals closely resemble their parents.				
Many characteristics of an organism are inherited from the parents of the organism, but other characteristics result from an individual's interactions with the environment. Inherited characteristics include the color of flowers and the number of limbs of an animal. Other features, such as the ability to ride a bicycle, are learned through interactions with the environment and cannot be passed on to the next generation.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
ORGANISMS AND THEIR ENVIRONMENTS				
All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.	● ● ●			
An organism's patterns of behavior are related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and resources, and the physical characteristics of the environment. When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.	● ●			
All organisms cause changes in the environment where they live. Some of these changes are detrimental to the organism or other organisms, whereas others are beneficial.	●			
Humans depend on their natural and constructed environments. Humans change environments in ways that can be either beneficial or detrimental for themselves and other organisms.	● ● ●			
GRADES K-4 — EARTH AND SPACE SCIENCE				
PROPERTIES OF EARTH MATERIALS				
Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials, as sources of fuel, or for growing the plants we use as food. Earth materials provide many of the resources that humans use.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES K-4 — EARTH AND SPACE SCIENCE (continued)				
PROPERTIES OF EARTH MATERIALS (continued)				
Soils have properties of color and texture, capacity to retain water, and ability to support the growth of many kinds of plants, including those in our food supply.				
Fossils provide evidence about the plants and animals that lived long ago and the nature of the environment at that time.				
OBJECTS IN THE SKY				
The sun, moon, stars, clouds, birds, and airplanes all have properties, locations, and movements that can be observed and described.		● ●		
The sun provides the light and heat necessary to maintain the temperature of the earth.	● ●	● ●		
CHANGES IN THE EARTH AND SKY				
The surface of the earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.				
Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation.				

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GRADES K-4 — EARTH AND SPACE SCIENCE (continued)				
CHANGES IN THE EARTH AND SKY (continued)				
Objects in the sky have patterns of movement. The sun, for example, appears to move across the sky in the same way every day, but its path changes slowly over the seasons. The moon moves across the sky on a daily basis much like the sun. The observable shape of the moon changes from day to day in a cycle that lasts about a month.		●●		
GRADES K-4 — SCIENCE AND TECHNOLOGY				
ABILITIES OF TECHNOLOGICAL DESIGN:				
Identify a simple problem. In problem identification, children should develop the ability to explain a problem in their own words and identify a specific task and solution related to the problem.	●●	●●		
Propose a solution. Students should make proposals to build something or get something to work better; they should be able to describe and communicate their ideas. Students should recognize that designing a solution might have constraints, such as cost, materials, time, space, or safety.		●●●		
Implementing proposed solutions. Children should develop abilities to work individually and collaboratively and to use suitable tools, techniques, and quantitative measurements when appropriate. Students should demonstrate the ability to balance simple constraints in problem solving.		●●●		

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES K-4 — SCIENCE AND TECHNOLOGY (continued)				
ABILITIES OF TECHNOLOGICAL DESIGN: (continued)				
Evaluate a product or design. Students should evaluate their own results or solutions to problems, as well as those of other children, by considering how well a product or design met the challenge to solve a problem. When possible, students should use measurements and include constraints and other criteria in their evaluations. They should modify designs based on the results of evaluations.		● ● ●		
Communicate a problem, design, and solution. Student abilities should include oral, written, and pictorial communication of the design process and product. The communication might be show and tell, group discussions, short written reports, or pictures, depending on the students' abilities and the design project.		● ● ●		
UNDERSTANDING ABOUT SCIENCE AND TECHNOLOGY				
People have always had questions about their world. Science is one way of answering questions and explaining the natural world.	● ● ●	● ● ●	● ● ●	● ● ●
People have always had problems and invented tools and techniques (ways of doing something) to solve problems. Trying to determine the effects of solutions helps people avoid some new problems.		● ●		
Scientists and engineers often work in teams with different individuals doing different things that contribute to the results. This understanding focuses primarily on teams working together and secondarily, on the combination of scientist and engineer teams.	● ●	● ●	● ●	● ●

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GRADES K-4 — SCIENCE AND TECHNOLOGY (continued)				
UNDERSTANDING ABOUT SCIENCE AND TECHNOLOGY (continued)				
Women and men of all ages, backgrounds, and groups engage in a variety of scientific and technological work.	• •	• •	• •	• •
Tools help scientists make better observations, measurements, and equipment for investigations. They help scientists see, measure, and do things that they could not otherwise see, measure, and do.	•	•••	• •	•
ABILITIES TO DISTINGUISH BETWEEN NATURAL OBJECTS AND OBJECTS MADE BY HUMANS				
Some objects occur in nature; others have been designed and made by people to solve human problems and enhance the quality of life.				
Objects can be categorized into two groups, natural and designed.				

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GRADES K-4 — SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES (continued)				
PERSONAL HEALTH				
Safety and security are basic needs of humans. Safety involves freedom from danger, risk, or injury. Security involves feelings of confidence and lack of anxiety and fear. Student understandings include following safety rules for home and school, preventing abuse and neglect, avoiding injury, knowing whom to ask for help, and when and how to say no.				
Individuals have some responsibility for their own health. Students should engage in personal care--dental hygiene, cleanliness, and exercise--that will maintain and improve health. Understandings include how communicable diseases, such as colds, are transmitted and some of the body's defense mechanisms that prevent or overcome illness.				
Nutrition is essential to health. Students should understand how the body uses food and how various foods contribute to health. Recommendations for good nutrition include eating a variety of foods, eating less sugar, and eating less fat.				
Different substances can damage the body and how it functions. Such substances include tobacco, alcohol, over-the-counter medicines, and illicit drugs. Students should understand that some substances, such as prescription drugs, can be beneficial, but that any substance can be harmful if used inappropriately.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES K-4 — SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES (continued)				
CHARACTERISTICS AND CHANGES IN POPULATIONS				
Human populations include groups of individuals living in a particular location. One important characteristic of a human population is the population density--the number of individuals of a particular population that lives in a given amount of space.				
The size of a human population can increase or decrease. Populations will increase unless other factors such as disease or famine decrease the population.				
TYPES OF RESOURCES				
Resources are things that we get from the living and nonliving environment to meet the needs and wants of a population.				
Some resources are basic materials, such as air, water, and soil; some are produced from basic resources, such as food, fuel, and building materials; and some resources are nonmaterial, such as quiet places, beauty, security, and safety.				
The supply of many resources is limited. If used, resources can be extended through recycling and decreased use.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES K-4 — SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES (continued)				
CHANGES IN ENVIRONMENTS				
Environments are the space, conditions, and factors that affect an individual's and a population's ability to survive and their quality of life.	●●			
Changes in environments can be natural or influenced by humans. Some changes are good, some are bad, and some are neither good nor bad. Pollution is a change in the environment that can influence the health, survival, or activities of organisms, including humans.	●●●			
Some environmental changes occur slowly, and others occur rapidly. Students should understand the different consequences of changing environments in small increments over long periods as compared with changing environments in large increments over short periods.	●			
SCIENCE AND TECHNOLOGY IN LOCAL CHALLENGES				
People continue inventing new ways of doing things, solving problems, and getting work done. New ideas and inventions often affect other people; sometimes the effects are good and sometimes they are bad. It is helpful to try to determine in advance how ideas and inventions will affect other people.		●	●	
Science and technology have greatly improved food quality and quantity, transportation, health, sanitation, and communication. These benefits of science and technology are not available to all of the people in the world.			●	

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GRADES K-4 — HISTORY AND NATURE OF SCIENCE				
SCIENCE AS A HUMAN ENDEAVOR				
Science and technology have been practiced by people for a long time.				
Men and women have made a variety of contributions throughout the history of science and technology.	••	••	••	••
Although men and women using scientific inquiry have learned much about the objects, events, and phenomena in nature, much more remains to be understood. Science will never be finished.				
Many people choose science as a career and devote their entire lives to studying it. Many people derive great pleasure from doing science.	•••	•••	•••	•••

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — SCIENCE AS INQUIRY				
UNDERSTANDINGS ABOUT SCIENTIFIC INQUIRY				
Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.	● ● ●	● ● ●	● ● ●	● ● ●
Current scientific knowledge and understanding guide scientific investigations. Different scientific domains employ different methods, core theories, and standards to advance scientific knowledge and understanding.	●	●	●	●
Mathematics is important in all aspects of scientific inquiry.				
Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.		● ● ●	● ●	● ●
Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.	● ● ●	● ● ●	● ● ●	● ● ●
Science advances through legitimate skepticism. Asking questions and querying other scientists' explanations is part of scientific inquiry. Scientists evaluate the explanations proposed by other scientists by examining evidence, comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations.	●	●	● ●	●

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — SCIENCE AS INQUIRY (continued)				
UNDERSTANDINGS ABOUT SCIENTIFIC INQUIRY (*continued*)				
Scientific investigations sometimes result in new ideas and phenomena for study, generate new methods or procedures for an investigation, or develop new technologies to improve the collection of data. All of these results can lead to new investigations.	● ● ●	● ● ●	● ●	● ● ●
GRADES 5-8 — PHYSICAL SCIENCE				
PROPERTIES AND CHANGES OF PROPERTIES IN MATTER				
A substance has characteristic properties, such as density, a boiling point, and solubility, all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties.			● ● ●	● ●
Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances often are placed in categories or groups if they react in similar ways; metals is an example of such a group.				● ●
Chemical elements do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and nonliving substances that we encounter.				● ● ●

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — PHYSICAL SCIENCE (continued)				
MOTIONS AND FORCES				
The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph.				
An object that is not being subjected to a force will continue to move at a constant speed and in a straight line.				
If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.				
TRANSFER OF ENERGY				
Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.			•	
Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.			• •	
Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection). To see an object, light from that object--emitted by or scattered from it--must enter the eye.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — PHYSICAL SCIENCE (continued)				
TRANSFER OF ENERGY (continued)				
Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.				
In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.				•
The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.	•	•		
GRADES 5-8 — LIFE SCIENCE				
STRUCTURE AND FUNCTION IN LIVING SYSTEMS				
Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems.	•			
All organisms are composed of cells--the fundamental unit of life. Most organisms are single cells; other organisms, including humans, are multicellular.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — LIFE SCIENCE (continued)				
STRUCTURE AND FUNCTION IN LIVING SYSTEMS (continued)				
Cells carry on the many functions needed to sustain life. They grow and divide, thereby producing more cells. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.				
Specialized cells perform specialized functions in multicellular organisms. Groups of specialized cells cooperate to form a tissue, such as a muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole.				
The human organism has systems for digestion, respiration, reproduction, circulation, excretion, movement, control, and coordination, and for protection from disease. These systems interact with one another.				
Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system. Others are the result of damage by infection by other organisms.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — LIFE SCIENCE (continued)				
REPRODUCTION AND HEREDITY				
Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually.	•			
In many species, including humans, females produce eggs and males produce sperm. Plants also reproduce sexually--the egg and sperm are produced in the flowers of flowering plants. An egg and sperm unite to begin development of a new individual. That new individual receives genetic information from its mother (via the egg) and its father (via the sperm). Sexually produced offspring never are identical to either of their parents.				
Every organism requires a set of instructions for specifying its traits. Heredity is the passage of these instructions from one generation to another.				
Hereditary information is contained in genes, located in the chromosomes of each cell. Each gene carries a single unit of information. An inherited trait of an individual can be determined by one or by many genes, and a single gene can influence more than one trait. A human cell contains many thousands of different genes.				
The characteristics of an organism can be described in terms of a combination of traits. Some traits are inherited and others result from interactions with the environment.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — LIFE SCIENCE (continued)				
REGULATION AND BEHAVIOR				
All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.	● ● ●			
Regulation of an organism's internal environment involves sensing the internal environment and changing physiological activities to keep conditions within the range required to survive.				
Behavior is one kind of response an organism can make to an internal or environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience.	● ●			
An organism's behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species' evolutionary history.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — LIFE SCIENCE (continued)				
POPULATIONS AND ECOSYSTEMS				
A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.	●●			
Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some micro-organisms are producers--they make their own food. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.	●●●			
For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.	●●●			
The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.	●			

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — LIFE SCIENCE (continued)				
DIVERSITY AND ADAPTATIONS OF ORGANISMS				
Millions of species of animals, plants, and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical processes, and the evidence of common ancestry.				
Biological evolution accounts for the diversity of species developed through gradual processes over many generations. Species acquire many of their unique characteristics through biological adaptation, which involves the selection of naturally occurring variations in populations. Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment.				
Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. Fossils indicate that many organisms that lived long ago are extinct. Extinction of species is common; most of the species that have lived on the earth no longer exist.				
GRADES 5-8 — EARTH AND SPACE SCIENCE				
STRUCTURE OF THE EARTH SYSTEM				
The solid earth is layered with a lithosphere; hot, convecting mantle; and dense, metallic core.				

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GRADES 5-8 — EARTH AND SPACE SCIENCE (continued)				
STRUCTURE OF THE EARTH SYSTEM (continued)				
Lithospheric plates on the scales of continents and oceans constantly move at rates of centimeters per year in response to movements in the mantle. Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from these plate motions.				
Land forms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediment, while destructive forces include weathering and erosion.				
Some changes in the solid earth can be described as the "rock cycle." Old rocks at the earth's surface weather, forming sediments that are buried, then compacted, heated, and often recrystallized into new rock. Eventually, those new rocks may be brought to the surface by the forces that drive plate motions, and the rock cycle continues.				
Soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria. Soils are often found in layers, with each having a different chemical composition and texture.				
Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.				
Water is a solvent. As it passes through the water cycle it dissolves minerals and gases and carries them to the oceans.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — EARTH AND SPACE SCIENCE (continued)				
STRUCTURE OF THE EARTH SYSTEM (continued)				
The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different properties at different elevations.				
Clouds, formed by the condensation of water vapor, affect weather and climate.				
Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.				
Living organisms have played many roles in the earth system, including affecting the composition of the atmosphere, producing some types of rocks, and contributing to the weathering of rocks.				
EARTH'S HISTORY				
The earth processes we see today, including erosion, movement of lithospheric plates, and changes in atmospheric composition, are similar to those that occurred in the past. earth history is also influenced by occasional catastrophes, such as the impact of an asteroid or comet.				
Fossils provide important evidence of how life and environmental conditions have changed.				

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GRADES 5-8 — EARTH AND SPACE SCIENCE (continued)				
EARTH IN THE SOLAR SYSTEM				
The earth is the third planet from the sun in a system that includes the moon, the sun, eight other planets and their moons, and smaller objects, such as asteroids and comets. The sun, an average star, is the central and largest body in the solar system.		● ● ●		
Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.		● ● ●		
Gravity is the force that keeps planets in orbit around the sun and governs the rest of the motion in the solar system. Gravity alone holds us to the earth's surface and explains the phenomena of the tides.		● ● ●		
The sun is the major source of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. Seasons result from variations in the amount of the sun's energy hitting the surface, due to the tilt of the earth's rotation on its axis and the length of the day.	●			

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GRADES 5-8 — SCIENCE AND TECHNOLOGY				
UNDERSTANDINGS ABOUT SCIENCE AND TECHNOLOGY				
Scientific inquiry and technological design have similarities and differences. Scientists propose explanations for questions about the natural world, and engineers propose solutions relating to human problems, needs, and aspirations. Technological solutions are temporary; technologies exist within nature and so they cannot contravene physical or biological principles; technological solutions have costs, carry risks, and provide benefits.				
Many different people in different cultures have made and continue to make contributions to science and technology.	●●	●●	●●	●●
Science and technology are reciprocal. Science helps drive technology, as it addresses questions that demand more sophisticated instruments and provides principles for better instrumentation and technique. Technology is essential to science, because it provides instruments and techniques that enable observations of objects and phenomena that are otherwise unobservable due to factors such as quantity, distance, location, size, and speed. Technology also provides tools for investigations, inquiry, and analysis.		●		
Perfectly designed solutions do not exist. All technological solutions have trade-offs, such as safety, cost, efficiency, and appearance. Engineers often build in back-up systems to provide safety. Risk is part of living in a highly technological world. Reducing risk often results in new technology.		●		
Technological designs have constraints. Some constraints are unavoidable, for example, properties of materials, or effects of weather and friction; other constraints limit choices in the design, for example, environmental protection, human safety, and aesthetics.		●●●		

●●●=*Major focus on concept, skill, or understanding, explicitly taught*
●●=*Moderate focus on concept, skill, or understanding with explicit teaching or practice*
●=Peripheral focus on concept, skill, or understanding with practice

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — SCIENCE AND TECHNOLOGY (continued)				
UNDERSTANDINGS ABOUT SCIENCE AND TECHNOLOGY (continued)				
Technological solutions have intended benefits and unintended consequences. Some consequences can be predicted, others cannot.		•		
GRADES 5-8 — SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES				
PERSONAL HEALTH				
Regular exercise is important to the maintenance and improvement of health. The benefits of physical fitness include maintaining healthy weight, having energy and strength for routine activities, good muscle tone, bone strength, strong heart/lung systems, and improved mental health. Personal exercise, especially developing cardiovascular endurance, is the foundation of physical fitness.				
The potential for accidents and the existence of hazards imposes the need for injury prevention. Safe living involves the development and use of safety precautions and the recognition of risk in personal decisions. Injury prevention has personal and social dimensions.				
The use of tobacco increases the risk of illness. Students should understand the influence of short-term social and psychological factors that lead to tobacco use, and the possible long-term detrimental effects of smoking and chewing tobacco.				
Alcohol and other drugs are often abused substances. Such drugs change how the body functions and can lead to addiction.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES (continued)				
PERSONAL HEALTH (continued)				
Food provides energy and nutrients for growth and development. Nutrition requirements vary with body weight, age, sex, activity, and body functioning.				
Sex drive is a natural human function that requires understanding. Sex is also a prominent means of transmitting diseases. The diseases can be prevented through a variety of precautions.				
Natural environments may contain substances (for example, radon and lead) that are harmful to human beings. Maintaining environmental health involves establishing or monitoring quality standards related to use of soil, water, and air.				
POPULATIONS, RESOURCES, AND ENVIRONMENTS				
When an area becomes overpopulated, the environment will become degraded due to the increased use of resources.				
Causes of environmental degradation and resource depletion vary from region to region and from country to country.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES (continued)				
NATURAL HAZARDS				
Internal and external processes of the earth system cause natural hazards, events that change or destroy human and wildlife habitats, damage property, and harm or kill humans. Natural hazards include earthquakes, landslides, wildfires, volcanic eruptions, floods, storms, and even possible impacts of asteroids.				
Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes.	● ●			
Natural hazards can present personal and societal challenges because misidentifying the change or incorrectly estimating the rate and scale of change may result in either too little attention and significant human costs or too much cost for unneeded preventive measures.				
RISKS AND BENEFITS				
Risk analysis considers the type of hazard and estimates the number of people that might be exposed and the number likely to suffer consequences. The results are used to determine the options for reducing or eliminating risks.				
Students should understand the risks associated with natural hazards (fires, floods, tornadoes, hurricanes, earthquakes, and volcanic eruptions), with chemical hazards (pollutants in air, water, soil, and food), with biological hazards (pollen, viruses, bacterial, and parasites), social hazards (occupational safety and transportation), and with personal hazards (smoking, dieting, and drinking).				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES (continued)				
RISKS AND BENEFITS (continued)				
Individuals can use a systematic approach to thinking critically about risks and benefits. Examples include applying probability estimates to risks and comparing them to estimated personal and social benefits.	•	•		
Important personal and social decisions are made based on perceptions of benefits and risks.				
SCIENCE AND TECHNOLOGY IN SOCIETY				
Science influences society through its knowledge and world view. Scientific knowledge and the procedures used by scientists influence the way many individuals in society think about themselves, others, and the environment. The effect of science on society is neither entirely beneficial nor entirely detrimental.				
Societal challenges often inspire questions for scientific research, and social priorities often influence research priorities through the availability of funding for research.				
Technology influences society through its products and processes. Technology influences the quality of life and the ways people act and interact. Technological changes are often accompanied by social, political, and economic changes that can be beneficial or detrimental to individuals and to society. Social needs, attitudes, and values influence the direction of technological development.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES (continued)				
SCIENCE AND TECHNOLOGY IN SOCIETY (continued)				
Science and technology have advanced through contributions of many different people, in different cultures, at different times in history. Science and technology have contributed enormously to economic growth and productivity among societies and groups within societies.				
Scientists and engineers work in many different settings, including colleges and universities, businesses and industries, specific research institutes, and government agencies.	•		••	
Scientists and engineers have ethical codes requiring that human subjects involved with research be fully informed about risks and benefits associated with the research before the individuals choose to participate. This ethic extends to potential risks to communities and property. In short, prior knowledge and consent are required for research involving human subjects or potential damage to property.				
Science cannot answer all questions and technology cannot solve all human problems or meet all human needs. Students should understand the difference between scientific and other questions. They should appreciate what science and technology can reasonably contribute to society and what they cannot do. For example, new technologies often will decrease some risks and increase others.				

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — HISTORY AND NATURE OF SCIENCE				
SCIENCE AS A HUMAN ENDEAVOR				
Women and men of various social and ethnic backgrounds--and with diverse interests, talents, qualities, and motivations--engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.	●●	●●	●●	●●
Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity--as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.	●	●	●	●
NATURE OF SCIENCE				
Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. Those ideas are not likely to change greatly in the future. Scientists do and have changed their ideas about nature when they encounter new experimental evidence that does not match their existing explanations.	●●●	●●●	●●●	●●●

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — HISTORY AND NATURE OF SCIENCE				
NATURE OF SCIENCE (continued)				
In areas where active research is being pursued and in which there is not a great deal of experimental or observational evidence and understanding, it is normal for scientists to differ with one another about the interpretation of the evidence or theory being considered. Different scientists might publish conflicting experimental results or might draw different conclusions from the same data. Ideally, scientists acknowledge such conflict and work towards finding evidence that will resolve their disagreement.	• •	• • •	•	• •
It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists. Evaluation includes reviewing the experimental procedures, examining the evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations. Although scientists may disagree about explanations of phenomena, about interpretations of data, or about the value of rival theories, they do agree that questioning, response to criticism, and open communication are integral to the process of science. As scientific knowledge evolves, major disagreements are eventually resolved through such interactions between scientists.	• •	•	• •	• •

	Aquatic Ecosystems	Planets & Moons	Models of Matter	Chemical Changes
GRADES 5-8 — HISTORY AND NATURE OF SCIENCE				
HISTORY OF SCIENCE				
Many individuals have contributed to the traditions of science. Studying some of these individuals provides further understanding of scientific inquiry, science as a human endeavor, the nature of science, and the relationships between science and society.				
In historical perspective, science has been practiced by different individuals in different cultures. In looking at the history of many peoples, one finds that scientists and engineers of high achievement are considered to be among the most valued contributors to their culture.				
Tracing the history of science can show how difficult it was for scientific innovators to break through the accepted ideas of their time to reach the conclusions that we currently take for granted.				