Greenwich Township School District

Science Curriculum

Adopted August 2011

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Science Curriculum
Philosophy

It is the philosophy of the Greenwich Township School District that elementary and middle school science should be taught, learned, and assessed in an inquiry-based manner. The scientific processes of observing, hypothesizing, investigating, analyzing, and drawing conclusions, as well as communicating and applying ideas and information will be the basis for developing scientific concepts and higher order thinking skills.

Students will engage in authentic, hands-on inquiries that are grade level appropriate and will incorporate multiple subject areas, specifically Technology, Engineering, and Mathematics (STEM).

This curriculum will provide a foundation of study to stimulate the curiosity of the student, and encourage logical thinking, innovation, and creativity which will lead to the mastery of scientific principles and to the solving of problems in our ever-changing world.

Science Curriculum
Assessment Philosophy

Students in the Greenwich Township School District Science program will be assessed in a variety of ways, including but not limited to: chapter and unit tests and quizzes, projects, labs, models, and/or simulations.

Assessments will be designed to demonstrate an understanding of science content and process knowledge and skills. Assessments will measure the ability to think critically and solve simple to complex problems, students' capabilities to design scientific experiments, analyze data, and draw conclusions. Students will be encouraged to see and articulate relationships between science topics and real-world issues and concerns through written, oral, or performance assessments. Skills that utilize mathematics, engineering and technology (STEM) as tools for learning will be incorporated throughout assessments.

Students who do not demonstrate proficiency will be given the opportunity to be reassessed within a reasonable amount of time, not to exceed two weeks.

Science Curriculum Outline

	K	1	2
General	• Observe, Question, Predict, Investigate, Communicate & Draw Conclusions • Grade level appropriate vocabulary • Identify & use basic tools • Safety • Handle organisms humanely	• Measure, Evaluate, Gather, & Share data • Revise Predictions • Communicate & Participate in group discussions using student data • Safety • Handle organisms humanely	• Use data & outcomes to refine questions, models & explanations • Critique scientific arguments Design & Follow simple investigation plans • Measure, Evaluate, Gather, & Share data • Revise Predictions • Formulate, communicate & justify explanations • Interpret & predict cause and effect • Reflect on how ideas change over time • Communicate & Participate in group discussions using student data • Safety • Handle organisms humanely
Physical	Matter • Observe • Sort • Identify & explore changes in solids, liquids, & gasses Energy ○ Investigate sound, heat & light energy • Forces & Motion	Matter • Observe • Sort • Identify & explore changes in solids, liquids, & gasses Forces & Motion • How & why things move	Matter • Observe • Sort • Identify & explore changes in solids, liquids, & gasses Energy • Heat, Light & Sound Forces & Motion • Speed

	K	1	2
	○ How & why things move		• Push & Pull

Life	Plants & Animals • Observing Physical characteristics • Observing Living & Non-living things • Care of Habitats • Survival • Interactions Heredity • Life Cycles • Traits of Parents & Offspring	Plants & Animals • Identifying Physical characteristics • Identifying Living & Non-living things • Care of Habitats • Survival • Interactions • Protecting Heredity • Life Cycles • Traits of Parents & Offspring Dinosaurs • Types, Food Sources, Time periods	Plants & Animals • Physical characteristics • Proving Living & Non-living things Habitats • Interactions • Survival • Protecting • Environmental adaptations Heredity • Life Cycles
Earth	Universe • Sun & Moon Earth materials • Soil, rocks, water, air • Characteristics Energy • Effects of sunlight Climate & Weather • Observe & record Earth Systems • Recycling • Conservation • Evaporation & Condensation • Natural Resources	Universe • Sun & Moon Earth materials • Soil, rocks, water, air • Properties Energy • Sun & Plant growth Earth Systems • Conservation • Evaporation & Condensation • Natural Resources	Universe • Sun & Moon • Shadows • Moon phases • Orbit & Rotation • Solar system objects Earth Systems • Needs of organisms & how they relate to the environment

	3	4	5
General	• Demonstrate understanding of Interrelationships of the sciences – Physical, Life & Earth • Use data & outcomes to refine questions, models & explanations • Measure, Evaluate, Gather, & Share data • Critique scientific arguments • Design & Follow simple investigation plans • Revise Predictions • Formulate, communicate & justify explanations • Reflect on how ideas change over time • Interpret & predict cause and effect • Communicate & Participate in group discussions using student data • Obtain multiple perspectives • Safety • Handle organisms humanely	• Demonstrate understanding of Use data & outcomes to refine questions, models & explanations • Measure, Evaluate, Gather, & Share data • Critique scientific arguments • Design & Follow simple investigation plans • Revise Predictions • Formulate, communicate & justify explanations • Reflect on how ideas change over time • Interpret & predict cause and effect • Reflect & refine concepts & ideas • Communicate & Participate in group discussions using student data • Obtain multiple perspectives • Safety • Handle organisms humanely	• Demonstrate understanding of Interrelationships of the sciences – Physical, Life & Earth o Revise explanations o Consider alternative explanations • Design & Conduct STEM (Science, Technology, Engineering & Mathematics) Investigations • Use quality controls in investigations • Reflect, Revise, & refine concepts & ideas based on new information • Obtain multiple perspectives • Safety • Handle organisms humanely

Physical	Matter • Weight & volume Forces & Motion • Gravity • Perspective	Matter • Weight & volume, density • Investigate solid, liquid & gas • Properties of matter • Atoms • Chemical reactions Energy • Forms of energy • Heat & Light • Electricity & Magnetism Forces & Motion • Speed & Force • Buoyancy • Simple Machines	Matter • Water displacement (M) • Chemical reactions ○ Photosynthesis / Respiration ▪ Carbon, Nitrogen, Water cycles Energy • Weather Phenomena ○ Hurricanes, Tornadoes, etc. Forces & Motion • Speed (M)
Life	Plants & Animals • Plant & Animal Cell Structure • Animal Classification • Food chains • Biotic & abiotic characteristics Environment • Ecosystems ○ Population impact ○ Weather impact ○ Natural disaster impact ○ Why dinosaurs disappeared Heredity • Life cycle comparisons		Supporting life • Cells ○ Single & multicellular ○ Organelles ○ Structures • Tissues, Organs & Systems Plants & Animals • Photosynthesis • Food chain • Producers & Consumers • Biotic & abiotic Environment • Ecosystems ○ Population effects ○ Human impacts Heredity

			• Reproduction patterns

Earth	Universe
	• Moon
	• Shadows
	• Orbit & Rotation
	History of Earth
	• Fossils
	• Rock layers
	• Erosion
	Earth's materials
	• Earth's Layers
	• Soil
	  ○ Ecosystems
	• Rocks/Minerals
	  ○ Types
	  ○ Properties
	Climate & Weather
	• Instrument patterns
	• Cloud formations
	• Cloud patterns
	• Water cycle
	• Properties of water
		Universe
		• Solar System
		  ○ Models
		  ○ Size & scale
		• Shadows
		• Orbit & Rotation
		• Gravity
		History of Earth
		• Fossils
		Energy & Earth's Systems
		• Temperature changes
		Climate & Weather
		• Cloud formations
		• Cloud patterns
			Universe
			• Moon phases
			• Eclipse
			• Tides
			• Climate / seasons
			Earth's materials
			• Soil
			  ○ Ecosystem support
			Energy & Earth's Systems
			• Convection currents
			• Alternative energy sources
			Climate & Weather
			• Relationship: Temperature, Air & Humidity
			• Climatograph
			• Weather maps
			• Hydrologic cycle
			• Wind & Surface currents
			Earth's Systems
			• Ecosystems & Biomes

<table>
<tr><th></th><th>6</th><th>7</th><th>8</th></tr>
<tr><td>General</td><td>Demonstrate understanding of Interrelationships of the sciences – Physical, Life & Earth
Revise explanations
Consider alternative explanations
Design & Conduct STEM (Science, Technology, Engineering & Mathematics) Investigations
Use quality controls in investigations
Reflect, Revise, & refine concepts & ideas based on new information
Generate new questions
Use Qualitative and Quantitative evidence
Obtain multiple perspectives
Face-to-Face
Virtual
Safety
Handle organisms humanely</td><td>Demonstrate understanding of Interrelationships of the sciences – Physical, Life & Earth
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<tr><td>Physical</td><td>Matter – Rocks & Minerals
Atoms & Elements
Chemical Reactions of Metals/Non-metals
Forces & Motion
Buoyancy</td><td>Matter
Atoms, elements, compounds
Chemical & physical change
Chemical / physical properties</td><td>Matter
Physical / chemical properties
Periodic Table
Chemical Changes
Acids & Bases
Energy</td></tr>
</table>

	6	7	8
			• Solar • Chemical • Kinetic & Potential Forces & Motion • Speed & Motion
Life	Human body systems (H) Species survival • Impact of environmental changes • Extinction • Fossils	Human body systems (H) Supporting life • Cells o Single & multi-cellular o Organelles o Structures Animals & Plants • Environmental situations Heredity • Genetic variations • Breeding • Traits • Environmental impacts • Extinction	Human body systems (H)
Earth	History of Earth • Rock Layers • Geologic time scale • Erosion • Land forms Earth's Materials • Rocks & Minerals • Tectonic Plates • Erosion Tectonics • Ring of Fire • Orienteering (T)	Earth's Systems • Sea temperatures • Alternative energy • Local & global environmental issues	Universe • Orbit, Rotation & Gravity • Moon Phases • Eclipse • Tides • Celestial bodies Earth's Materials • Properties of soil • Remote sensing tools o Model earth's atmosphere Energy in Earth's Systems

	6	7	8
	• Layers of the earth (model) • Plate motion • Geographic north & geomagnetic north		• Transfer of solar energy

GREENWICH TOWNSHIP SCHOOLS
CURRICULUM

B=Beginning Skill
D=Developing Skill
S=Secure Skill
* = Mathematics Concept
H = Health Concept

STANDARD (subject): 5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.

Strand A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.

Indicator #	K	1	2	3	4	5	6	7	8
5.1.P.A.1 Display curiosity about science objects, materials, activities, and longer-term investigations in progress.	S								
5.1.4.A.1 Demonstrate understanding of the interrelationships among fundamental concepts in the physical, life, and Earth systems sciences.				B	S				
5.1.4.A.2 Use outcomes of investigations to build and refine questions, models, and explanations.			B	D	S				
5.1.4.A.3 Use scientific facts, measurements, observations, and patterns in nature to build and critique scientific arguments.			B	D	S				
5.1.8.A.1 Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.						B	D	D	S
5.1.8.A.2 Use mathematical, physical, and computational tools to build						B	D	D	S

conceptual-based models and to pose theories.									
5.1.8.A.3 Use scientific principles and models to frame and synthesize scientific arguments and pose theories.						B	D	D	S

Strand B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.

Indicator #	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5.1.P.B.1 Observe, question, predict, and investigate materials, objects, and phenomena (e.g., using simple tools to crack a nut and look inside) during indoor and outdoor classroom activities and during any longer-term investigations.	S								
5.1.P.B.2 Use basic science terms and topic-related science vocabulary.	S								
5.1.P.B.3 Identify and use basic tools and technology to extend exploration in conjunction with science investigations.	S								
5.1.4.B.1 Design and follow simple plans using systematic observations to explore questions and predictions.			B	D	S				
5.1.4.B.2 Measure, gather, evaluate, and share evidence using tools and technologies.		B	D	D	S				
5.1.4.B.3 Formulate explanations from evidence.			B	D	S				
5.1.4.B.4 Communicate and justify explanations with reasonable and logical arguments.			B	D	S				
5.1.8.B.1 Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.						B	D	D	S
5.1.8.B.2 Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.						B	D	D	S
5.1.8.B.3 Use qualitative and quantitative evidence to develop evidence-based arguments.							B	D	S

5.1.8.B.4 Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.						B	D	D	S

Strand C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.

Indicator #	K	1	2	3	4	5	6	7	8
5.1.P.C.1 Communicate with other children and adults to share observations, pursue questions, and make predictions and/or conclusions.	S								
5.1.4.C.1 Monitor and reflect on one's own knowledge regarding how ideas change over time.			B	D	S				
5.1.4.C.2 Revise predictions or explanations on the basis of learning new information.		B	D	D	S				
5.1.4.C.3 Present evidence to interpret and/or predict cause-and-effect outcomes of investigations.			B	D	S				
5.1.8.C.1 Monitor one's own thinking as understandings of scientific concepts are refined.					B	D	D	D	S
5.1.8.C.2 Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.						B	D	S	
5.1.8.C.3 Generate new and productive questions to evaluate and refine core explanations.							B	D	S

Strand D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.

Indicator #	K	1	2	3	4	5	6	7	8
5.1.P.D.1 Represent observations and work through drawing, recording	S								

data, and "writing."									
5.1.4.D.1 Actively participate in discussions about student data, questions, and understandings.		B	D	D	S				
5.1.4.D.2 Work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories.			B	D	S				
5.1.8.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.				B	D	D	D	D	S
5.1.8.D.2 Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.							B	D	S
5.1.8.D.3 Demonstrate how to safely use grade level appropriate tools, instruments, and supplies.	B	D	D	D	D	D	D	D	S
5.1.8.D.4 Handle and treat organisms humanely, responsibly, and ethically.	B	D	D	D	D	D	D	D	S

GREENWICH TOWNSHIP SCHOOLS
Curriculum 5.2

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Standard 5.2 Physical Science All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.

Strand A. Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.

Indicator #	K	1	2	3	4	5	6	7	8
5.2.P.A.1 Observe, manipulate, sort, and describe objects and materials (e.g., water, sand, clay, paint, glue, various types of blocks, collections of objects, simple household items that can be taken apart, or objects made of wood, metal, or cloth) in the classroom and outdoor environment based on size, shape, color, texture, and weight.	S								
5.2.2.A.1 Sort and describe objects based on the materials of which they are made and their physical properties.	S								
5.2.2.A.2 Identify common objects as solids, liquids, or gases.	B	D	S						
5.2.4.A.1 Identify objects that are composed of a single substance and those that are composed of more than one substance using simple	B	D	D	D	S				

Indicator #	K	1	2	3	4	5	6	7	8
tools found in the classroom.									
5.2.4.A.2 Plan and carry out an investigation to distinguish among solids, liquids, and gasses.			B		S				
5.2.4.A.3 Determine the weight and volume of common objects using appropriate tools.				B*	S*				
5.2.4.A.4 Categorize objects based on the ability to absorb or reflect light and conduct heat or electricity.					S				
5.2.6.A.1 Determine the volume of common objects using water displacement methods.					B	D*	S		
5.2.6.A.2 Calculate the density of objects or substances after determining volume and mass.					B		S		
5.2.6.A.3 Determine the identity of an unknown substance using data about intrinsic properties.					B		S		
5.2.8.A.1 Explain that all matter is made of atoms, and give examples of common elements.					B		D	S	
5.2.8.A.2 Analyze and explain the implications of the statement "all substances are composed of elements."							B	S	
5.2.8.A.3 Use the kinetic molecular model to predict how solids, liquids, and gases would behave under various physical circumstances, such as heating or cooling.								B	S
5.2.8.A.4 Predict the physical and chemical properties of elements based on their positions on the Periodic Table.								B	S
5.2.8.A.5 Identify unknown substances based on data regarding their physical and chemical properties.								B	S
5.2.8.A.6 Determine whether a substance is a metal or nonmetal through student-designed investigations.							B	S	
5.2.8.A.7 Determine the relative acidity and reactivity of common acids, such as vinegar or cream of tartar, through a variety of student-designed investigations.									S

Strand B. Changes in Matter: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.

Indicator #	K	1	2	3	4	5	6	7	8
5.2.P.B.1 Explore changes in liquids and solids when substances are combined, heated, or cooled (e.g., mix sand or clay with various amounts of water; mix different colors of tempera paints; freeze and melt water and other liquids).	B	S							
5.2.2.B.1 Generate accurate data and organize arguments to show that not all substances respond the same way when heated or cooled, using common materials, such as shortening or candle wax.			S						
5.2.4.B.1 Predict and explain what happens when a common substance, such as shortening or candle wax, is heated to melting and then cooled to a solid.			B	S					
5.2.6.B.1 Compare the properties of reactants with the properties of the products when two or more substances are combined and react chemically.					B		S		
5.2.8.B.1 Explain, using an understanding of the concept of chemical change, why the mass of reactants and the mass of products remain constant.							B	D	S
5.2.8.B.2 Compare and contrast the physical properties of reactants with products after a chemical reaction, such as those that occur during photosynthesis and cellular respiration.						B		S	

Strand C. Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.

Indicator #	K	1	2	3	4	5	6	7	8

Indicator #	K	1	2	3	4	5	6	7	8
5.2.P.C.1 Investigate sound, heat, and light energy (e.g., the pitch and volume of sound made by commercially made and homemade instruments, looking for shadows on the playground over time and under different weather conditions) through one or more of the senses.	S								
5.2.2.C.1 Compare, citing evidence, the heating of different colored objects placed in full sunlight.			S						
5.2.2.C.2 Apply a variety of strategies to collect evidence that validates the principle that if there is no light, objects cannot be seen.			S						
5.2.2.C.3 Present evidence that represents the relationship between a light source, solid object, and the resulting shadow.			S						
5.2.4.C.1 Compare various forms of energy as observed in everyday life and describe their applications.					S				
5.2.4.C.2 Compare the flow of heat through metals and nonmetals by taking and analyzing measurements.					S				
5.2.4.C.3 Draw and label diagrams showing several ways that energy can be transferred from one place to another.					S				
5.2.4.C.4 Illustrate and explain what happens when light travels from air into water.					S				
5.2.6.C.1 Predict the path of reflected or refracted light using reflecting and refracting telescopes as examples.					S				
5.2.6.C.2 Describe how prisms can be used to demonstrate that visible light from the Sun is made up of different colors.					S				
5.2.6.C.3 Relate the transfer of heat from oceans and land masses to the evolution of a hurricane.						S			
5.2.8.C.1 Structure evidence to explain the relatively high frequency of tornadoes in "Tornado Alley."						S			
5.2.8.C.2 Model and explain current technologies used to capture solar energy for the purposes of converting it to electrical energy.									S

Strand D. Energy Transfer and Conservation: The conservation of energy can be demonstrated by keeping track of familiar forms of energy as they are transferred from one object to another.

Indicator #	K	1	2	3	4	5	6	7	8
5.2.2.D.1 Predict and confirm the brightness of a light, the volume of sound, or the amount of heat when given the number of batteries, or the size of batteries.			S						
5.2.4.D.1 Repair an electric circuit by completing a closed loop that includes wires, a battery (or batteries), and at least one other electrical component to produce observable change.					S				
5.2.6.D.1 Use simple circuits involving batteries and motors to compare and predict the current flow with different circuit arrangements.					S				
5.2.8.D.1 Relate the kinetic and potential energies of a roller coaster at various points on its path.									S
5.2.8.D.2 Describe the flow of energy from the Sun to the fuel tank of an automobile.									S

Strand E. Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of forces.

Indicator #	K	1	2	3	4	5	6	7	8
5.2.P.E.1 Investigate how and why things move (e.g., slide blocks, balance structures, push structures over, use ramps to explore how far and how fast different objects move or roll).	S								
5.2.2.E.1 Investigate and model the various ways that inanimate objects can move.	B	S							
5.2.2.E.2 Predict an object's relative speed, path, or how far it will travel using various forces and surfaces.			S						
5.2.2.E.3 Distinguish a force that acts by direct contact with an object			S						

(e.g., by pushing or pulling) from a force that can act without direct contact (e.g., the attraction between a magnet and a steel paper clip).									
5.2.4.E.1 Demonstrate through modeling that motion is a change in position over a period of time.					S				
5.2.4.E.2 Identify the force that starts something moving or changes its speed or direction of motion.			B		S				
5.2.4.E.3 Investigate and categorize materials based on their interaction with magnets.					S				
5.2.4.E.4 Investigate, construct, and generalize rules for the effect that force of gravity has on balls of different sizes and weights.				S					
5.2.6.E.1 Model and explain how the description of an object's motion from one observer's view may be different from a different observer's view.				S					
5.2.6.E.2 Describe the force between two magnets as the distance between them is changed.					S				
5.2.6.E.3 Demonstrate and explain the frictional force acting on an object with the use of a physical model.					S				
5.2.6.E.4 Predict if an object will sink or float using evidence and reasoning.					B		S		
5.2.8.E.1 Calculate the speed of an object when given distance and time					B	D*			S
5.2.8.E.2 Compare the motion of an object acted on by balanced forces with the motion of an object acted on by unbalanced forces in a given specific scenario.									S

GREENWICH TOWNSHIP SCHOOLS
CURRICULUM 5.3

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STANDARD (subject): Standard 5.3 Life Science All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.

Strand A. Organization and Development: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.

Indicator #	K	1	2	3	4	5	6	7	8
5.3.P.A.1 Investigate and compare the basic physical characteristics of plants, humans, and other animals.	S								
5.3.P.A.2 Observe similarities and differences in the needs of various living things, and differences between living and nonliving things.	S								
5.3.2.A.1 Group living and nonliving things according to the characteristics that they share.	B	S							
5.3.4.A.1 Develop and use evidence-based criteria to determine if an unfamiliar object is living or nonliving.			S						

Indicator #	K	1	2	3	4	5	6	7	8
5.3.4.A.2 Compare and contrast structures that have similar functions in various organisms, and explain how those functions may be carried out by structures that have different physical appearances.				S					
5.3.4.A.3 Describe the interactions of systems involved in carrying out everyday life activities.		BH	DH	DH	SH				
5.3.6.A.1 Model the interdependence of the human body's major systems in regulating its internal environment.							DH	DH	SH
5.3.6.A.2 Model and explain ways in which organelles work together to meet the cell's needs.						B		S	
5.3.8.A.1 Compare the benefits and limitations of existing as a single-celled organism and as a multicellular organism.						B		S	
5.3.8.A.2 Relate the structures of cells, tissues, organs, and systems to their functions in supporting life.						S			

Strand B. Matter and Energy Transformations: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food, and some organisms obtain their food directly from other organisms.

Indicator #	K	1	2	3	4	5	6	7	8
5.3.P.B.1 Observe and describe how plants and animals obtain food from their environment, such as by observing the interactions between organisms in a natural habitat.	B	S							
5.3.2.B.1 Describe the requirements for the care of plants and animals related to meeting their energy needs.	B	S							
5.3.2.B.2 Compare how different animals obtain food and water.	B	S							
5.3.2.B.3 Explain that most plants get water from soil through their roots and gather light through their leaves.	B	S							
5.3.4.B.1 Identify sources of energy (food) in a variety of settings (farm, zoo, ocean, forest).				S					

5.3.6.B.1 Describe the sources of the reactants of photosynthesis and trace the pathway to the products.						S			
5.3.6.B.2 Illustrate the flow of energy (food) through a community.						S			
5.3.8.B.1 Relate the energy and nutritional needs of organisms in a variety of life stages and situations, including stages of development and periods of maintenance.						B		S	
5.3.8.B.2 Analyze the components of a consumer's diet and trace them back to plants and plant products.						B		S	

Strand C. Interdependence: All animals and most plants depend on both other organisms and their environment to meet their basic needs.

Indicator #	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5.3.P.C.1 Observe and describe how natural habitats provide for the basic needs of plants and animals with respect to shelter, food, water, air, and light (e.g., dig outside in the soil to investigate the kinds of animal life that live in and around the ground).	S								
5.3.2.C.1 Describe the ways in which organisms interact with each other and their habitats in order to meet basic needs.	B	D	S						
5.3.2.C.2 Identify the characteristics of a habitat that enable the habitat to support the growth of many different plants and animals.	B	D	S						
5.3.2.C.3 Communicate ways that humans protect habitats and/or improve conditions for the growth of the plants and animals that live there, or ways that humans might harm habitats.		B	S						
5.3.4.C.1 Predict the biotic and abiotic characteristics of an unfamiliar organism's habitat.				S					
5.3.4.C.2 Explain the consequences of rapid ecosystem change (e.g., flooding, wind storms, snowfall, volcanic eruptions), and compare them to consequences of gradual ecosystem change (e.g., gradual increase				S					

or decrease in daily temperatures, change in yearly rainfall).									
5.3.6.C.1 Explain the impact of meeting human needs and wants on local and global environments.					S				
5.3.6.C.2 Predict the impact that altering biotic and abiotic factors has on an ecosystem.					S				
5.3.6.C.3 Describe how one population of organisms may affect other plants and/or animals in an ecosystem.					S				

Strand D. Heredity and Reproduction: Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.

Indicator #	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5.3.P.D.1 Observe and record change over time and cycles of change that affect living things (e.g., use baby photographs to discuss human change and growth, observe and photograph tree growth and leaf changes throughout the year, monitor the life cycle of a plant).	S								
5.3.2.D.1 Record the observable characteristics of plants and animals to determine the similarities and differences between parents and their offspring.	B	S							
5.3.2.D.2 Determine the characteristic changes that occur during the life cycle of plants and animals by examining a variety of species, and distinguish between growth and development.	B	D	S						
5.3.4.D.1 Compare the physical characteristics of the different stages of the life cycle of an individual organism, and compare the characteristics of life stages among species.				S					
5.3.6.D.1 Predict the long-term effect of interference with normal patterns of reproduction.						S			
5.3.6.D.2 Explain how knowledge of inherited variations within and between generations is applied to farming and animal breeding.								S	

5.3.6.D.3 Distinguish between inherited and acquired traits/characteristics.								S	
5.3.8.D.1 Defend the principle that, through reproduction, genetic traits are passed from one generation to the next, using evidence collected from observations of inherited traits.								S	
5.3.8.D.2 Explain the source of variation among siblings.								S	
5.3.8.D.3 Describe the environmental conditions or factors that may lead to a change in a cell's genetic information or to an organism's development, and how these changes are passed on.								S	

Strand E. Evolution and Diversity: Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.

Indicator #	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5.3.2.E.1 Describe similarities and differences in observable traits between parents and offspring.	B	S							
5.3.2.E.2 Describe how similar structures found in different organisms (e.g., eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments.	B	S							
5.3.4.E.1 Model an adaptation to a species that would increase its chances of survival, should the environment become wetter, dryer, warmer, or colder over time.			B	S					
5.3.4.E.2 Evaluate similar populations in an ecosystem with regard to their ability to thrive and grow.				S					
5.3.6.E.1 Describe the impact on the survival of species during specific times in geologic history when environmental conditions changed.							S		
5.3.8.E.1 Organize and present evidence to show how the extinction of							B	S	

a species is related to an inability to adapt to changing environmental conditions using quantitative and qualitative data.									
5.3.8.E.2 Compare the anatomical structures of a living species with fossil records to derive a line of descent.							S		

GREENWICH TOWNSHIP SCHOOLS
CURRICULUM 5.4

B=Beginning Skill
D=Developing Skill
S=Secure Skill
* = Mathematics Concept
H = Health Concept
T = Technology Concept

STANDARD (subject): Standard 5.4 Earth Systems Science All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.

Strand A. Objects in the Universe: Our universe has been expanding and evolving for 13.7 billion years under the influence of gravitational and nuclear forces. As gravity governs its expansion, organizational patterns, and the movement of celestial bodies, nuclear forces within stars govern its evolution through the processes of stellar birth and death. These same processes governed the formation of our solar system 4.6 billion years ago.

Indicator #	K	1	2	3	4	5	6	7	8
5.4.2.A.1 Determine a set of general rules describing when the Sun and Moon are visible based on actual sky observations.	B	D	S						
5.4.4.A.1 Formulate a general description of the daily motion of the Sun across the sky based on shadow observations. Explain how shadows could be used to tell the time of day.			B		S				
5.4.4.A.2 Identify patterns of the Moon's appearance and make predictions about its future appearance based observational data.			B		S				
5.4.4.A.3 Generate a model with explanatory value that explains both why objects roll down ramps as well as why the Moon orbits Earth.			B	D	S				

Indicator #	K	1	2	3	4	5	6	7	8
5.4.4.A.4 Analyze and evaluate evidence in the form of data tables and photographs to categorize and relate solar system objects (e.g., planets, dwarf planets, moons, asteroids, and comets).				B	S				
5.4.6.A.1 Generate and analyze evidence (through simulations) that the Sun's apparent motion across the sky changes over the course of a year.					S				
5.4.6.A.2 Construct and evaluate models demonstrating the rotation of Earth on its axis and the orbit of Earth around the Sun.					S				
5.4.6.A.3 Predict what would happen to an orbiting object if gravity were increased, decreased, or taken away.					B				S
5.4.6.A.4 Compare and contrast the major physical characteristics (including size and scale) of solar system objects using evidence in the form of data tables and photographs.					B				S
5.4.8.A.1 Analyze moon-phase, eclipse, and tidal data to construct models that explain how the relative positions and motions of the Sun, Earth, and Moon cause these three phenomena.						B			S
5.4.8.A.2 Use evidence of global variations in day length, temperature, and the amount of solar radiation striking Earth's surface to create models that explain these phenomena and seasons.						S			
5.4.8.A.3 Predict how the gravitational force between two bodies would differ for bodies of different masses or bodies that are different distances apart.									S
5.4.8.A.4 Analyze data regarding the motion of comets, planets, and moons to find general patterns of orbital motion.									S

Strand B. History of Earth: From the time that Earth formed from a nebula 4.6 billion years ago, it has been evolving as a result of geologic, biological, physical, and chemical processes.

Indicator #	K	1	2	3	4	5	6	7	8
5.4.4.B.1 Use data gathered from observations of fossils to argue				B	S				

Indicator #	K	1	2	3	4	5	6	7	8
whether a given fossil is terrestrial or marine in origin.									
5.4.6.B.1 Interpret a representation of a rock layer sequence to establish oldest and youngest layers, geologic events, and changing life forms.				B			S		
5.4.6.B.2 Examine Earth's surface features and identify those created on a scale of human life or on a geologic time scale.							S		
5.4.6.B.3 Determine if landforms were created by processes of erosion (e.g., wind, water, and/or ice) based on evidence in pictures, video, and/or maps.				B			S		
5.4.6.B.4 Describe methods people use to reduce soil erosion.							S		
5.4.8.B.1 Correlate the evolution of organisms and the environmental conditions on Earth as they changed throughout geologic time.							S		
5.4.8.B.2 Evaluate the appropriateness of increasing the human population in a region (e.g., barrier islands, Pacific Northwest, Midwest United States) based on the region's history of catastrophic events, such as volcanic eruptions, earthquakes, and floods.							S		

Strand C. Properties of Earth Materials: Earth's composition is unique, is related to the origin of our solar system, and provides us with the raw resources needed to sustain life.

Indicator #	K	1	2	3	4	5	6	7	8
5.4.P.C.1 Explore and describe characteristics of and concepts about soil, rocks, water, and air.	S								
5.4.2.C.1 Describe Earth materials using appropriate terms, such as hard, soft, dry, wet, heavy, and light.	B	S							
5.4.4.C.1 Create a model to represent how soil is formed.				S					
5.4.4.C.2 Categorize unknown samples as either rocks or minerals.				S					

Indicator #	K	1	2	3	4	5	6	7	8
5.4.6.C.1 Predict the types of ecosystems that unknown soil samples could support based on soil properties.				B		S			
5.4.6.C.2 Distinguish physical properties of sedimentary, igneous, or metamorphic rocks and explain how one kind of rock could eventually become a different kind of rock.				B			S		
5.4.6.C.3 Deduce the story of the tectonic conditions and erosion forces that created sample rocks or rock formations.							S		
5.4.8.C.1 Determine the chemical properties of soil samples in order to select an appropriate location for a community garden.									S
5.4.8.C.2 Explain how chemical and physical mechanisms (changes) are responsible for creating a variety of landforms.							S		
5.4.8.C.3 Model the vertical structure of the atmosphere using information from active and passive remote-sensing tools (e.g., satellites, balloons, and/or ground-based sensors) in the analysis.									S

Strand D. Tectonics: The theory of plate tectonics provides a framework for understanding the dynamic processes within and on Earth.

Indicator #	K	1	2	3	4	5	6	7	8
5.4.6.D.1 Apply understanding of the motion of lithospheric plates to explain why the Pacific Rim is referred to as the Ring of Fire.							S		
5.4.6.D.2 Locate areas that are being created (deposition) and destroyed (erosion) using maps and satellite images.							S		
5.4.6.D.3 Apply knowledge of Earth's magnetic fields to successfully complete an orienteering challenge.							ST		
5.4.8.D.1 Model the interactions between the layers of Earth.							S		
5.4.8.D.2 Present evidence to support arguments for the theory of plate motion.							S		
5.4.8.D.3 Explain why geomagnetic north and geographic north are at different locations.							S		

Strand E. Energy in Earth Systems: Internal and external sources of energy drive Earth systems.

Indicator #	K	1	2	3	4	5	6	7	8
5.4.P.E.1 Explore the effects of sunlight on living and nonliving things.	S								
5.4.2.E.1 Describe the relationship between the Sun and plant growth.	B	S							
5.4.4.E.1 Develop a general set of rules to predict temperature changes of Earth materials, such as water, soil, and sand, when placed in the Sun and in the shade.					S				
5.4.6.E.1 Generate a conclusion about energy transfer and circulation by observing a model of convection currents.						S			
5.4.8.E.1 Explain how energy from the Sun is transformed or transferred in global wind circulation, ocean circulation, and the water cycle.						B			S

Strand F. Climate and Weather: Earth's weather and climate systems are the result of complex interactions between land, ocean, ice, and atmosphere.

Indicator #	K	1	2	3	4	5	6	7	8
5.4.P.F.1 Observe and record weather.	S								
5.4.2.F.1 Observe and document daily weather conditions and discuss how the weather influences your activities for the day.	S								
5.4.4.F.1 Identify patterns in data collected from basic weather instruments.				S					
5.4.6.F.1 Explain the interrelationships between daily temperature, air pressure, and relative humidity data.						S			

5.4.6.F.2 Create climatographs for various locations around Earth and categorize the climate based on the yearly patterns of temperature and precipitation.						S			
5.4.8.F.1 Determine the origin of local weather by exploring national and international weather maps.						S			
5.4.8.F.2 Explain the mechanisms that cause varying daily temperature ranges in a coastal community and in a community located in the interior of the country.						S			
5.4.8.F.3 Create a model of the hydrologic cycle that focuses on the transfer of water in and out of the atmosphere. Apply the model to different climates around the world.						S			

Strand G. Biogeochemical Cycles: The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.

Indicator #	K	1	2	3	4	5	6	7	8
5.4.P.G.1 Demonstrate emergent awareness for conservation, recycling, and respect for the environment (e.g., turning off water faucets, using paper from a classroom scrap box when whole sheets are not needed, keeping the playground neat and clean).	S								
5.4.2.G.1 Observe and discuss evaporation and condensation.	B	S							
5.4.2.G.2 Identify and use water conservation practices.	B	S							
5.4.2.G.3 Identify and categorize the basic needs of living organisms as they relate to the environment.	B	D	S						
5.4.2.G.4 Identify the natural resources used in the process of making various manufactured products.	B	S							
5.4.4.G.1 Explain how clouds form.				B	S				
5.4.4.G.2 Observe daily cloud patterns, types of precipitation, and				B	S				

Indicator #	K	1	2	3	4	5	6	7	8
temperature, and categorize the clouds by the conditions that form precipitation.									
5.4.4.G.3 Trace a path of a drop of water might follow through the water cycle.				S					
5.4.4.G.4 Model how the properties of water can change as water moves through the water cycle.				S					
5.4.6.G.1 Illustrate global winds and surface currents through the creation of a world map of global winds and currents that explains the relationship between the two factors.						S			
5.4.6.G.2 Create a model of ecosystems in two different locations, and compare and contrast the living and nonliving components.						S			
5.4.6.G.3 Describe ways that humans can improve the health of ecosystems around the world.						S			
5.4.8.G.1 Represent and explain, using sea surface temperature maps, how ocean currents impact the climate of coastal communities.						B		S	
5.4.8.G.2 Investigate a local or global environmental issue by defining the problem, researching possible causative factors, understanding the underlying science, and evaluating the benefits and risks of alternative solutions.								S	

Science Curriculum
Materials List

K-5	MacMillan McGraw-Hill, 2005
6-8	Holt Science & Technology, 2005 • Cells, Heredity & Classification • Interactions of Matter • Introduction of Matter • Environmental Science • Forces, Motion, Energy • Astronomy • Water on Earth • Earth's Changing Surface • Inside the Restless Earth