SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: General Science	**Length of Course:** 30 cycles
Grade Level(s): 8	**Periods Per Cycle:** 6
Units of Credit: N/A	**Length of Period:** 47 minutes
Classification: Required	**Total Instructional Time:** 141 hours

Course Description

The 8th grade General Science course will be presented in a spiral format, building upon content in previous grades. The 8th grade General Science course will cover a variety of science topics including Earth and Space, Astronomy, Life/Biology, Geology, Ecology, Chemical and Physical Science.

Instructional Strategies, Learning Practices, Activities, and Experiences

Anchor Charts	Graphic Organizers	Projects (Oral and Written)
Anticipatory Sets	Guided Practice	Remediation
Assessments (Quizzes, Unit, Teacher-Created)	Higher-Level Questioning	Research Projects
Bell Ringers/Warm-ups	Homework	Re-teaching
Class Discussions	Internet Links and Interactive Activities	Review (Games, Study Guides)
Closure	Interaction Sequence	Simulations
Concept Maps	Journals	Standardized Test Preparation
Cooperative Learning	Lab Experiments and Write-ups	Teacher Demonstrations
Critical Thinking	Map Creation and Interpretation	Teacher Observations
Cross Curricular Connections	Manipulatives	Technology Integration
Directed reading worksheets	Notes (Templates, Teacher or Student Generated)	Videos/DVDs
Entrance and Exit Passes	Partners (Think-Pair-Share)	Visual Aids (Charts, Diagrams, Models, etc.)
Essays	Posted and Numbered Objectives	Vocabulary (Cards, Strategies, and Lists)
Flexible Groups	Practice Exercises	Wait Time and Wait Time Extended
Graph Creation and Interpretation	Presentations	

Assessments

Assessments (Quizzes, Unit, Teacher-Created)	Evaluation (Summative and Formative)	Presentations
Bell Ringers	Higher-Level Questioning	State Standardized Assessments
Closure	Homework Review	Projects
CDT	Interaction Sequence	Rubrics
Entrance and Exit Passes	Lab Experiments and Write-ups	Teacher Observations

Materials/Resources

Anchor Charts	Literature	Study Guides
Graphic Organizers	Manipulatives	Technology Integration
Internet Resources	Note Packets	Videos/DVDs
Journals	PowerPoints	Vocabulary (Cards, Strategies, and Lists)
Laboratory Equipment and Supplies	Resource Books	

Adopted: 4/20/88
Revised: 9/3/91; 8/19/98; 11/15/01; 8/20/07; 5/19/14

Science and Technology and Engineering Education

How the Solar System Works	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Through demonstrations and worksheets, students will: • Understand the patterns of the Earth's movements in the solar system. • Understand how gravity rules those movements. • Identify the nature and composition of bodies in the solar system and the scale of the solar system. • Comprehend how our understanding of the solar system advanced from anecdotal opinion to scientific theory.	4.4.8.A. - Identify and describe how food safety issues have impacted the **food and fiber system.** 4.5.8.A. - Explain how **Best Management Practices (BMP)** can be used to mitigate environmental problems. 4.5.8.C. - Describe how humans can reduce pollution. 4.5.8.D. - Compare and contrast waste generated from various sources of energy. 3.1.8.A8 - CHANGE AND CONSTANCY Explain mechanisms organisms use to adapt to their environment. 3.1.8.A9 – • Compare and contrast scientific theories. • Know that both direct and indirect observations are used by scientists to study the natural world and universe. • Identify questions and concepts that guide scientific investigations. • Formulate and revise explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models. • Explain the importance of accuracy and precision in making valid measurements. 3.2.8.B1. - Explain how **inertia** is a measure of an object's **mass**. Explain how momentum is related to the forces acting on an object. 3.2.8.B2. - Identify situations where kinetic energy is transformed into potential energy, and vice versa.

How the Solar System Works (Continued)	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
	3.2.8.B3. - Explain how changes in temperature are accompanied by changes in kinetic energy. 3.2.8.B4. - Compare and contrast atomic properties of conductors and insulators. 3.2.8.B6. PATTERNS Explain how physics principles underlie everyday phenomena and important technologies. 3.2.8.B7. - • Compare and contrast scientific theories. • Know that both direct and indirect observations are used by scientists to study the natural world and universe. • Identify questions and concepts that guide scientific investigations. • Formulate and revise explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models. • Explain the importance of accuracy and precision in making valid measurements. 3.3.8.A1. - Distinguish between physical and chemical weathering. Compare and contrast the types of energy that drive Earth's systems. 3.3.8.A2. - Describe renewable and nonrenewable energy resources. 3.3.8.A3. - Explain how matter on earth is conserved throughout the geological processes over time. 3.3.8.A4. - Explain how the oceans form one interconnected circulation system powered by wind, tides, the Earth's rotation, and water density differences. 3.3.8.A5. - Explain how the curvature of the earth contributes to climate. Compare and contrast water vapor, clouds, and humidity.

How the Solar System Works (Continued)	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
	3.3.8.A6. CHANGES Explain changes in earth systems in terms of energy transformation and transport. MODELS Explain how satellite images, models, and maps are used to identify Earth's resources. 3.3.8.B1. - Explain how light, measured remotely, can be used to classify objects in the universe. 3.3.8.B2. - SCALE AND MEASUREMENT Explain measurements and evidence indicating the age of the universe. 3.4.8.B1. - Evaluate the societal implications of the management of waste produced by **technology**. 3.4.8.B2. - Compare and contrast decisions to develop and use **technologies** as related to environmental and economic concerns. 3.4.8.B3. - Explain how throughout history, new **technologies** have resulted from the demands, values, and interests of individuals, businesses, industries, and societies. 3.4.8.B4. - Explain how societal and cultural priorities and values are reflected in technological devices.

Reproduction and Heredity	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit, students learn about the related topics of reproduction, inheritance, and adaptations. This unit is intended as an introduction to genetics. Students will: • Compare sexual and asexual reproduction. • Differentiate between inherited and acquired traits. • Relate genes to the inheritance of traits. • Differentiate between structural and behavioral adaptations. • Explain how adaptations can increase organisms' chances of survival and reproduction.	3.1.8.A8 - CHANGE AND CONSTANCY Explain mechanisms organisms use to adapt to their environment. 3.1.8.A9 – • Compare and contrast scientific theories. • Know that both direct and indirect observations are used by scientists to study the natural world and universe. • Identify questions and concepts that guide scientific investigations. • Formulate and revise explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models. • Explain the importance of accuracy and precision in making valid measurements. 3.1.8.C1. - Explain how reproductive success coupled with advantageous traits over many generations contributes to **natural selection**.

Biological Changes	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit, students learn that natural selection is based on the principle of survival of the fittest. Students develop a clear understanding of selective breeding in terms of domestication and selective breeding in dogs. Students also learn about how mutations can affect organisms and how they relate to natural selection. Students will: • Explain the basic concepts of natural selection. • Read and discuss an article about selective breeding in domestic dogs. • Write an essay about the role humans should play in dog evolution. • Understand how mutations can alter genes and may be beneficial, detrimental, or neutral. • Understand that an altered gene may be passed on to every cell that develops from it, causing an altered phenotype in an organism. • Understand how sometimes entire chromosomes can be added or deleted, resulting in a genetic disorder (e.g., Down syndrome, Turner syndrome).	3.1.8.C1. - Explain how reproductive success coupled with advantageous traits over many generations contributes to **natural selection**. 3.1.8.C4 - • Compare and contrast scientific theories. • Know that both direct and indirect observations are used by scientists to study the natural world and universe. • Identify questions and concepts that guide scientific investigations. • Formulate and revise explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models. • Explain the importance of accuracy and precision in making valid measurements. 3.4.8.C1. - Evaluate the criteria and constraints of a design. 3.4.8.C2. - Explore the design process as a collaborative endeavor in which each person in the group presents his or her ideas in an open forum. 3.4.8.C3. - Analyze how a multi-disciplinary **(STEM)** approach to problem solving will yield greater results. 3.4.8.D1. - Test and evaluate the solutions for a design problem. 3.4.8.D2. - Operate and maintain systems in order to achieve a given purpose. 3.4.8.D3. - Interpret and evaluate the accuracy of the information obtained and determine its usefulness.

Biological Changes (Continued)	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
	3.4.8.E1. - Analyze what technologies are used in genetic engineering and predict how it may change the future of medicine. 3.4.8.E2. - Describe how biotechnology applies the principles of biology to create commercial products or processes. 3.4.8.E3. - Examine power systems are used to drive and provide propulsion to other technological products or systems. 3.4.8.E4. - Describe how the design of the message is influenced by such factors as the intended audience, medium, purpose, and nature of the message. 3.4.8.E5. - Describe how governmental regulations influence the design, operation and efficiency of transportation systems. 3.4.8.E6. - Analyze the steps involved in the manufacturing process (e.g., design, development, production, marketing and servicing of products and **systems)**. 3.4.8.E7. - Analyze factors that determine structural design (e.g., building laws and codes, style, convenience, cost, climate, and function).

Geology and the Battle of Gettysburg	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit, students connect the geologic history of Pennsylvania to the tactics of the Battle of Gettysburg. Students will: • Investigate the geologic history of the Gettysburg battlefield. • Analyze the Gettysburg battlefield in terms of the rock cycle. • Connect battle tactics of the Gettysburg campaign to the geologic history of the battlefield.	3.3.8.A1. - Distinguish between physical and chemical weathering. Compare and contrast the types of energy that drive Earth's systems. 3.3.8.A2. - Describe renewable and nonrenewable energy resources. 3.3.8.A3. - Explain how matter on earth is conserved throughout the geological processes over time. 3.3.8.A4. - Explain how the oceans form one interconnected circulation system powered by wind, tides, the Earth's rotation, and water density differences. 3.3.8.A5. - Explain how the curvature of the earth contributes to climate. Compare and contrast water vapor, clouds, and humidity. 3.3.8.A6. <u>CHANGES</u> Explain changes in earth systems in terms of energy transformation and transport. <u>MODELS</u> Explain how satellite images, models, and maps are used to identify Earth's resources. 3.3.8.A7. - • Compare and contrast scientific theories. • Know that both direct and indirect observations are used by scientists to study the natural world and universe. • Identify questions and concepts that guide scientific investigations. • Formulate and revise explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models. • Explain the importance of accuracy and precision in making valid measurements.

Matter Matters	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit students will discover that everything they see, touch, and smell is made of matter. They will investigate topics such as matter classification, separation techniques, physical properties, and chemical properties. Students will: • Differentiate between pure substances and mixtures. • Recognize homogeneous and heterogeneous mixtures on a visible and molecular level. • Differentiate between colloids, suspensions, and solutions. • Differentiate between an element and a compound. • Determine the mixture category into which a given material falls, based on laboratory experience. • Describe specific physical properties (density, viscosity, boiling point, freezing point, and conductivity).	3.2.8.A1. - Differentiate between mass and weight. 3.2.8.A2. - Identify characteristics of elements derived from the **periodic table**. 3.2.8.A3. - Explain how changes in matter are accompanied by changes in energy. 3.2.8.A4. - Compare and contrast physical and chemical changes in terms of products. 3.2.8.A6. - • Compare and contrast scientific theories. • Know that both direct and indirect observations are used by scientists to study the natural world and universe. • Identify questions and concepts that guide scientific investigations. • Formulate and revise explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models. • Explain the importance of accuracy and precision in making valid measurements.

Earth's Structure and Processes	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit, students will understand that features on Earth's surface are constantly changing through a combination of slow and rapid processes. Students will: • Identify the causes of features on Earth's surface. • Compare and contrast between chemical and physical weathering. • Understand slow processes such as tectonic plate movement, weathering, erosion, and sediment deposition. • Understand rapid processes such as landslides, volcanic eruptions, and earthquakes.	3.3.8.A1. - Distinguish between physical and chemical weathering. Compare and contrast the types of energy that drive Earth's systems. 3.3.8.A2. - Describe renewable and nonrenewable energy resources. 3.3.8.A3. - Explain how matter on earth is conserved throughout the geological processes over time. 3.3.8.A4. - Explain how the oceans form one interconnected circulation system powered by wind, tides, the Earth's rotation, and water density differences. 3.3.8.A5. - Explain how the curvature of the earth contributes to climate. Compare and contrast water vapor, clouds, and humidity. 3.3.8.A6. CHANGES Explain changes in earth systems in terms of energy transformation and transport. MODELS Explain how satellite images, models, and maps are used to identify Earth's resources. 3.4.8.C1. - Evaluate the criteria and constraints of a design. 3.4.8.C2. - Explore the design process as a collaborative endeavor in which each person in the group presents his or her ideas in an open forum. 3.4.8.C3. - Analyze how a multi-disciplinary **(STEM)** approach to problem solving will yield greater results. 3.4.8.D1. - Test and evaluate the solutions for a design problem. 3.4.8.D2. - Operate and maintain systems in order to achieve a given purpose. 3.4.8.D3. - Interpret and evaluate the accuracy of the information obtained and determine its usefulness.

Principles of Force and Motion	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Through demonstrations and worksheets, students will understand: • That motion is the product of unbalanced force. • the difference between kinetic and potential energy • the advantages offered by simple machines	3.2.8.B1. - Explain how **inertia** is a measure of an object's **mass**. Explain how momentum is related to the forces acting on an object. 3.2.8.B2. - Identify situations where kinetic energy is transformed into potential energy, and vice versa. 3.2.8.B3. - Explain how changes in temperature are accompanied by changes in kinetic energy. 3.2.8.B4. - Compare and contrast atomic properties of conductors and insulators. 3.2.8.B6. PATTERNS Explain how physics principles underlie everyday phenomena and important technologies. 3.2.8.B7. - • Compare and contrast scientific theories. • Know that both direct and indirect observations are used by scientists to study the natural world and universe. • Identify questions and concepts that guide scientific investigations. • Formulate and revise explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models. • Explain the importance of accuracy and precision in making valid measurements.

H2O	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit, students will learn about the properties of water. Students will also discover freshwater and saltwater properties and their similarities and differences. Students will also engage in various activities to help them understand the concepts of watersheds and wetlands, as well as the adaptations of aquatic organisms. Students will: • Describe the physical and chemical properties of water. • Identify the similarities and differences between freshwater and saltwater systems. • Explain how adaptations of aquatic organisms help them to survive in their environments. • Trace the stages of the water cycle. • Identify and define a watershed. • Analyze the role of wetlands and their importance to watersheds.	4.2.8.A. - Describe factors that affect the quality of ground and surface waters. 4.2.8.B. - Explain the value of **wetlands** to other living things. 4.2.8.C. - Describe how a **diversity index** is used to assess water quality.

Hierarchy of Ecological Relationships	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit, students examine various relationships between organisms in ecosystems. Students will: • Apply the concept of trophic levels in ecosystems. • Trace the flow of energy through ecosystems using food chains, food webs, and energy pyramids. • Compare various symbiotic relationships (e.g., predator–prey, parasitism, mutualism, and commensalism). • Examine the effects of human activities on relationships in a coral reef ecosystem.	4.2.8.C. - Describe how a **diversity index** is used to assess water quality. 4.3.8.A. - Compare and contrast alternative sources of energy. 4.5.8.A. - Explain how **Best Management Practices (BMP)** can be used to mitigate environmental problems. 3.3.8.A1. - Distinguish between physical and chemical weathering. Compare and contrast the types of energy that drive Earth's systems. 3.3.8.A2. - Describe renewable and nonrenewable energy resources. 3.3.8.A3. - Explain how matter on earth is conserved throughout the geological processes over time. 3.3.8.A4. - Explain how the oceans form one interconnected circulation system powered by wind, tides, the Earth's rotation, and water density differences. 3.3.8.A5. - Explain how the curvature of the earth contributes to climate. Compare and contrast water vapor, clouds, and humidity. 3.3.8.A6. <u>CHANGES</u> Explain changes in earth systems in terms of energy transformation and transport. <u>MODELS</u> Explain how satellite images, models, and maps are used to identify Earth's resources.

Our Moon	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit, students will study how we use technology to learn about the Moon, compare the characteristics of the Moon to Earth, and explore patterns shown by the Moon (i.e., tides, Moon phases, and lunar eclipses). Students will: • Identify tools that have been used to study the Moon. • Compare the properties and conditions of the Earth to the Moon. • Explain the effects of gravity on the motion of the Moon and Earth in relation to each other and to the Sun. • Describe the patterns shown in tides, Moon phases, and lunar eclipses. • Observe and record the Moon's phases.	4.2.7.C. - Use appropriate tools and techniques to analyze a freshwater **environment**. • Interpret physical, chemical, and biological data as a means of assessing the **environmental** quality of a freshwater **environment**. 4.4.7.D. - Identify the positive and negative effects of **technology** used in a**griculture** and its effects on the **food and fiber system** and the **environment** over time. 3.3.7.B1. - Explain how **gravity** is the major force in the formation of the planets, stars, and the **solar system**. Describe **gravity** as a major force in determining the motions of planets, stars, and the **solar system.** Compare and contrast properties and conditions of objects in the **solar system** to those on Earth. 3.3.7.B2. - SCALE AND MEASUREMENT Identify a variety of instruments used to gather evidence about the universe. PATTERNS Describe repeating patterns in the Sun-Earth-Moon **system** and the positions of stars. SCALE Relate planetary size and distance in our **solar system** using an appropriate scale model.

Magnets and Electricity	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit, students learn about magnetism and electricity. Students will: • Describe how electrical conductivity and magnetism can be used to distinguish substances from each other. • Describe how a magnetic compass extends our human abilities. • Build an electromagnet and describe how it works. • Use Ohm's law to relate voltage, current, and resistance in an electrical circuit. • Describe how various energy sources can be transformed to electrical energy.	3.2.6.A1. - Distinguish the differences in properties of solids, liquids, and gases. Differentiate between volume and mass. Investigate that equal volumes of different substances usually have different masses. 3.2.6.A2. - Compare and contrast pure substances with mixtures. 3.2.6.A3. - Explain and give examples of how **mass** is conserved in a closed **system.** 3.2.6.A4. - Differentiate between physical changes and chemical changes. 3.2.6.A5. - CONSTANCY AND CHANGE Identify characteristic properties of matter that can be used to separate one substance from the other. 3.2.6.A6. – • Understand how theories are developed. • Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions. • Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations. • Describe relationships using inference and prediction. • Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations. • Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories. • Analyze alternative explanations and understanding that science advances through legitimate skepticism. • Use mathematics in all aspects of scientific inquiry. • Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.

Magnets and Electricity (Continued)	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
	3.2.6.B1. - Explain how changes in motion require a force. 3.2.6.B2. - Describe energy as a property of objects associated with heat, light, electricity, magnetism, mechanical motion, and sound. Differentiate between potential and kinetic energy. 3.2.6.B3. - Give examples of how heat moves in predictable ways, normally flowing from warmer objects to cooler ones until they reach the same temperature. Explain the effect of heat on particle motion by describing what happens to particles during a phase change. 3.2.6.B4. - Describe how electric current produces magnetic forces and how moving magnets produce electric current. Derive Ohm's Law through investigation of voltage, current, and resistance. 3.2.6.B6. – ENERGY Demonstrate that heat moves in predictable ways from warmer objects to cooler ones. SCALE Investigate that materials may be composed of parts too small to be seen without magnification. 3.2.6.B7. – • Understand how theories are developed. • Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions. • Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations. • Describe relationships using inference and prediction. • Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations. • Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories. • Analyze alternative explanations and understanding that science advances through legitimate skepticism. • Use mathematics in all aspects of scientific inquiry. • Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.

Light and Sound	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
In this unit, students will understand the structure and properties of materials, including atoms, waves, light, electricity, and magnetism. They will also understand the role of energy, forces, and motion. Students will: • Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions. • Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations. • Describe relationships using inference and prediction. • Use appropriate tools and technologies to gather, analyze, and interpret data. • Understand that data enhances accuracy and allows scientists to analyze and quantify results of investigations.	3.2.5.B1. - Explain how mass of an object resists change to motion. 3.2.5.B2. - Examine how energy can be transferred from one form to another. 3.2.5.B3. - Demonstrate how heat energy is usually a byproduct of an energy transformation. 3.2.5.B4. - Demonstrate how electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced. Demonstrate how electromagnets can be made and used. 3.2.5.B5. - Compare the characteristics of sound as it is transmitted through different materials. Relate the rate of vibration to the pitch of the sound. 3.2.5.B7. - • Understand how theories are developed. • Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions. • Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations. • Describe relationships using inference and prediction. • Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations. • Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories. • Analyze alternative explanations and understanding that science advances through legitimate skepticism. • Use mathematics in all aspects of scientific inquiry. • Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.