

Curriculum Map: Science 8

Course: SCIENCE 8 Sub-topic: General

Grade(s): 8

Course Description: The 8th Grade Science curriculum builds on what students learned in their two previous years. Using a spiral method, lessons and activities are intended to build on and further student knowledge and engagement in a variety of topics in the realm of science. Students engage with and learn about many topics in the Life and Physical Science disciplines respectively.

Unit: Scientific Inquiry

Timeline: 2 Weeks

Unit Description: Students are introduced to 8th Grade Science by completing several inquiry based labs. Students learn vocabulary and then apply that vocabulary to hands on labs. They are taken through the steps of a lab and how to think like a scientist

STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.A.1 (Advanced)	Reasoning and Analysis	
S8.A.1.1 (Advanced)	Explain, interpret, and apply scientific, environmental, or technological knowledge presented in a variety of formats (e.g., visuals, scenarios, graphs).	
S8.A.1.1.1 (Advanced)	Distinguish between a scientific theory and an opinion, explaining how a theory is supported with evidence, or how new data/information may change existing theories and practices.	
S8.A.1.1.2 (Advanced)	Explain how certain questions can be answered through scientific inquiry and/or technological design.	
S8.A.1.1.3 (Advanced)	Use evidence, such as observations or experimental results, to support inferences about a relationship.	
S8.A.1.1.4 (Advanced)	Develop descriptions, explanations, predictions, and models using evidence.	
S8.A.1.2 (Advanced)	Describe the positive and negative, intended and unintended, effects of specific scientific results or technological developments (e.g., air/space travel, genetic engineering, nuclear fission/fusion, artificial intelligence, lasers, organ transplants).	
S8.A.1.2.1 (Advanced)	Describe the positive and negative, intended and unintended, effects of specific scientific results or technological developments (e.g., air/space travel, genetic engineering, nuclear fission/fusion, artificial intelligence, lasers, organ transplants).	
S8.A.1.2.2 (Advanced)	Identify environmental issues and explain their potential long-term health effects (e.g., pollution, pest controls, vaccinations).	
S8.A.1.2.3 (Advanced)	Describe fundamental scientific or technological concepts that could solve practical problems (e.g., Newton's laws of motion, Mendelian genetics).	
S8.A.1.2.4 (Advanced)	Explain society's standard of living in terms of technological advancements and how these advancements impact on agriculture (e.g., transportation, processing, production, storage).	
S8.A.1.3 (Advanced)	Identify and analyze evidence that certain variables may have caused measurable changes in natural or human-made systems.	
S8.A.1.3.1 (Advanced)	Use ratio to describe change (e.g., percents, parts per million, grams per cubic centimeter, mechanical advantage).	
S8.A.1.3.2 (Advanced)	Use evidence, observations, or explanations to make inferences about change in systems over time (e.g., carrying capacity, succession, population dynamics, loss of mass in chemical reactions, indicator fossils in geologic time scale) and the variables affecting these changes.	
S8.A.1.3.3 (Advanced)	Examine systems changing over time, identifying the possible variables causing this change, and drawing inferences about how these variables affect this change.	
S8.A.1.3.4 (Advanced)	Given a scenario, explain how a dynamically changing environment provides for the sustainability of living systems.	
S8.A.2 (Advanced)	Processes, Procedures, and Tools of Scientific Investigations	
S8.A.2.1 (Advanced)	Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.	
S8.A.2.1.1 (Advanced)	Use evidence, observations, or a variety of scales (e.g., mass, distance, volume, temperature) to describe relationships.	

S8.A.2.1.2 (Advanced)	Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.	
S8.A.2.1.3 (Advanced)	Design a controlled experiment by specifying how the independent variables will be manipulated, how the dependent variable will be measured, and which variables will be held constant.	
S8.A.2.1.4 (Advanced)	Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.	
S8.A.2.1.5 (Advanced)	Use evidence from investigations to clearly communicate and support conclusions.	
S8.A.2.1.6 (Advanced)	Identify a design flaw in a simple technological system and devise possible working solutions.	
S8.A.2.2 (Advanced)	Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.	
 		
 		

Topic: What is Good Science?

Topic: Importance of Modeling

Unit: Growth, Development, and Reproduction of Organisms

Timeline: 3 Weeks

Unit Description: We begin with the smallest unit of life to begin our Biology portion. Students are reintroduced to cells and how they grow. This lesson is intended to review from previous grades and set us up for larger organism structure and behavior. We also cover DNA and lay the ground work for how that presents in organisms and how that can affect an organisms ability to survive and thrive in their environment.

STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.B.1 (Advanced)	Structure and Function of Organisms	
S8.B.1.1 (Advanced)	Describe and compare structural and functional similarities and differences that characterize diverse living things.	
S8.B.1.1.1 (Advanced)	Describe the structures of living things that help them function effectively in specific ways (e.g., adaptations, characteristics).	
S8.B.1.1.2 (Advanced)	Compare similarities and differences in internal structures of organisms (e.g., invertebrate/vertebrate, vascular/nonvascular, singlecelled/ multi-celled) and external structures (e.g., appendages, body segments, type of covering, size, shape).	
S8.B.1.1.3 (Advanced)	Apply knowledge of characteristic structures to identify or categorize organisms (i.e., plants, animals, fungi, bacteria, and protista).	
S8.B.1.1.4 (Advanced)	Identify the levels of organization from cell to organism and describe how specific structures (parts), which underlie larger systems, enable the system to function as a whole.	
S8.B.2 (Advanced)	Continuity of Life	
S8.B.2.1 (Advanced)	Explain the basic concepts of natural selection.	
S8.B.2.1.1 (Advanced)	Explain how inherited structures or behaviors help organisms survive and reproduce in different environments.	
S8.B.2.1.2 (Advanced)	Explain how different adaptations in individuals of the same species may affect survivability or reproduction success.	
S8.B.2.1.3 (Advanced)	Explain that mutations can alter a gene and are the original source of new variations.	
S8.B.2.1.4 (Advanced)	Describe how selective breeding or biotechnology can change the genetic makeup of organisms.	
S8.B.2.1.5 (Advanced)	Explain that adaptations are developed over long periods of time and are passed from one generation to another.	
S8.B.2.2 (Advanced)	Explain how a set of genetic instructions determines inherited traits of organisms.	
S8.B.2.2.1 (Advanced)	Identify and explain differences between inherited and acquired traits.	
S8.B.2.2.2 (Advanced)	Recognize that the gene is the basic unit of inheritance, that there are dominant and recessive genes, and that traits are inherited.	
S8.B.3 (Advanced)	Ecological Behavior and Systems	
S8.B.3.1 (Advanced)	Explain the relationships among and between organisms in different ecosystems and their abiotic and biotic components.	
S8.B.3.1.1 (Advanced)	Explain the flow of energy through an ecosystem (e.g., food chains, food webs).	
S8.B.3.1.2	Identify major biomes and describe abiotic and biotic	

(Advanced)	components (e.g., abiotic: different soil types, air, water sunlight; biotic: soil microbes, decomposers).	
S8.B.3.1.3 (Advanced)	Explain relationships among organisms (e.g., producers/ consumers, predator/prey) in an ecosystem.	
S8.B.3.2 (Advanced)	Identify evidence of change to infer and explain the ways different variables may affect change in natural or human-made systems.	
S8.B.3.2.1 (Advanced)	Use evidence to explain factors that affect changes in populations (e.g., deforestation, disease, land use, natural disaster, invasive species).	
S8.B.3.2.2 (Advanced)	Use evidence to explain how diversity affects the ecological integrity of natural systems.	
S8.B.3.2.3 (Advanced)	Describe the response of organisms to environmental changes (e.g., changes in climate, hibernation, migration, coloration) and how those changes affect survival.	
 		
 		

Topic: Gregor Mendel and Genetics

Topic: Species, Populations, Communities, & Ecosystems

Topic: Flowering Plants

Topic: Animal and Plant Cells

Unit: Natural Selection and Adaptations

Timeline: 3 Weeks

Unit Description: Students are presented with the ideas and theories behind the biological diversity we see on today's planet. They are shown the behaviors, structures, and evidence of how organisms have changed over time. Students are given scenarios that they will need to use their understanding of the Biology of organisms to predict how the organism would fare in an environment. They are given the opportunity to make predictions in order to help them understand how nature slowly progresses to give advantageous traits.

STANDARDS: STANDARDS

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S8.B.1.1.3 (Advanced)	Apply knowledge of characteristic structures to identify or categorize organisms (i.e., plants, animals, fungi, bacteria, and protista).	
S8.B.1.1.4 (Advanced)	Identify the levels of organization from cell to organism and describe how specific structures (parts), which underlie larger systems, enable the system to function as a whole.	
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S8.B.3.1 (Advanced)	Explain the relationships among and between organisms in different ecosystems and their abiotic and biotic components.	
S8.B.3.1.1 (Advanced)	Explain the flow of energy through an ecosystem (e.g., food chains, food webs).	
S8.B.3.1.2 (Advanced)	Identify major biomes and describe abiotic and biotic components (e.g., abiotic: different soil types, air, water sunlight; biotic: soil microbes, decomposers).	
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Topic: Charles Darwin and Natural Selection

Topic: Evidence of Evolution

Topic: Classification of Living Organisms

Topic: Food Webs and Trophic Levels

Unit: Human Impacts

Timeline: 2 Weeks

Unit Description: Students look at current events to help them understand the impacts that humans have on the environment and opportunities to improve the environment. Students are given multiple examples and asked to critically think about how we can become a net-zero carbon planet and small steps they can take to achieve that. Students are also presented with potential job sectors that will be expanding by the time they hit the workforce.

STANDARDS: STANDARDS

STATE: [Pennsylvania State Anchors \(2010\)](#)

S8.B.3.2 (Advanced)	Identify evidence of change to infer and explain the ways different variables may affect change in natural or human-made systems.	
S8.B.3.3 (Advanced)	Explain how renewable and nonrenewable resources provide for human needs or how these needs impact the environment.	
S8.B.3.3.1 (Advanced)	Explain how human activities may affect local, regional, and global environments.	
S8.B.3.3.2 (Advanced)	Explain how renewable and nonrenewable resources provide for human needs (i.e., energy, food, water, clothing, and shelter).	

This Curriculum Map Unit has no Topics to display

Unit: Earth's Systems

Timeline: 1 Weeks

Unit Description: Students are reintroduced to the systems that make up the earth including the layers of the earth and the atmosphere. These are covered heavily in previous years so this is a review and helps build on the impact that humans can have on these systems.

STANDARDS: STANDARDS

STATE: [Pennsylvania State Anchors \(2010\)](#)

S8.D.1 (Advanced)	Earth Features and Processes that Change Earth and Its Resources	
S8.D.1.1 (Advanced)	Describe constructive and destructive natural processes that form different geologic structures and resources.	
S8.D.1.1.1 (Advanced)	Explain the rock cycle as changes in the solid earth and rock types (igneous – granite, basalt, obsidian, pumice; sedimentary – limestone, sandstone, shale, coal; and	

	metamorphic – slate, quartzite, marble, gneiss).	
S8.D.1.1.2 (Advanced)	Describe natural processes that change Earth's surface (e.g., landslides, volcanic eruptions, earthquakes, mountain building, new land being formed, weathering, erosion, sedimentation, soil formation).	
S8.D.1.1.3 (Advanced)	Identify soil types (i.e., humus, topsoil, subsoil, loam, loess, and parent material) and their characteristics (i.e., particle size, porosity, and permeability) found in different biomes and in Pennsylvania, and explain how they formed.	
S8.D.1.1.4 (Advanced)	Explain how fossils provide evidence about plants and animals that once lived throughout Pennsylvania's history (e.g., fossils provide evidence of different environments).	
S8.D.1.2 (Advanced)	Describe the potential impact of humanmade processes on changes to Earth's resources and how they affect everyday life.	
S8.D.1.2.1 (Advanced)	Describe a product's transformation process from production to consumption (e.g., prospecting, propagating, growing, maintaining, adapting, treating, converting, distributing, disposing) and explain the process's potential impact on Earth's resources.	
S8.D.1.2.2 (Advanced)	Describe potential impacts of humanmade processes (e.g., manufacturing, agriculture, transportation, mining) on Earth's resources, both nonliving (i.e., air, water, or earth materials) and living (i.e., plants and animals).	
S8.D.1.3 (Advanced)	Describe characteristic features of Earth's water systems or their impact on resources.	
S8.D.1.3.1 (Advanced)	Describe the water cycle and the physical processes on which it depends (i.e., evaporation, condensation, precipitation, transpiration, runoff, infiltration, energy inputs, and phase changes).	
S8.D.1.3.2 (Advanced)	Compare and contrast characteristics of freshwater and saltwater systems on the basis of their physical characteristics (i.e., composition, density, and electrical conductivity) and their use as natural resources.	
S8.D.1.3.3 (Advanced)	Distinguish among different water systems (e.g., wetland systems, ocean systems, river systems, watersheds) and describe their relationships to each other as well as to landforms.	
S8.D.1.3.4 (Advanced)	Identify the physical characteristics of a stream and how these characteristics determine the types of organisms found within the stream environment	
	(e.g., biological diversity, water quality, flow rate, tributaries, surrounding watershed).	
S8.D.2 (Advanced)	Weather, Climate, and Atmospheric Processes	
S8.D.2.1 (Advanced)	Explain how pressure, temperature, moisture, and wind are used to describe atmospheric conditions that affect regional weather or climate.	
S8.D.2.1.1 (Advanced)	Explain the impact of water systems on the local weather or the climate of a region (e.g., lake effect snow, land/ocean breezes).	
S8.D.2.1.2 (Advanced)	Identify how global patterns of atmospheric movement influence regional weather and climate.	
S8.D.2.1.3 (Advanced)	Identify how cloud types, wind directions, and barometric pressure changes are associated with weather patterns in different regions of the country.	
S8.D.3 (Advanced)	Composition and Structure of the Universe	
S8.D.3.1 (Advanced)	Explain the relationships between and among the objects of our solar system.	
S8.D.3.1.1 (Advanced)	Describe patterns of earth's movements (i.e., rotation and revolution) in relation to the moon and sun (i.e., phases, eclipses, and tides)	
S8.D.3.1.2 (Advanced)	Describe the role of gravity as the force that governs the movement of the solar system and universe.	
S8.D.3.1.3 (Advanced)	Compare and contrast characteristics of celestial bodies found in the solar system (e.g., moons, asteroids, comets, meteors, inner and outer planets).	

Topic:

Unit: Structure and Properties of Matter

Timeline: 4 Weeks

Unit Description: Students look at the Periodic Table of Elements in depth. They review concepts from previous grades such as structure and properties of atoms and then going even further to look at diagramming atoms and understanding how they fit together to create all matter. Students are given multiple types of elements and predict how they will bond, while also drawing them out.

STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.1 (Advanced) Structure, Properties, and Interaction of Matter and Energy

S8.C.1.1 (Advanced) Explain concepts about the structure and properties (physical and chemical) of matter.

Topic: The Periodic Table of Elements

Topic: Atoms

Topic: Bohr Modeling

Unit: Chemical Reactions

Timeline: 4 Weeks

Unit Description:	After working with elements and molecules, students are given full chemical reactions to analyze. They look at the reactants and products of reactions to help predict where the reactions take place in the world. They are also tasked with balancing reactions to help cement the Law of Conservation of Matter. Students also look at molecules and elements as they pertain to the transfer of heat and where substances land on the pH scale
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STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.1.1.3 Identify and describe reactants and products of simple

(Advanced) chemical reactions.

Topic: Chemical Bonding

Topic: Balancing Chemical Reactions

Unit: Properties of Matter (Physical and Chemical)

STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.1.1 (Advanced) Explain concepts about the structure and properties (physical and chemical) of matter.

S8.C.1.1.2 Use characteristic physical or chemical properties to distinguish one substance from another (e.g., density, thermal expansion/contraction, freezing/melting points, streak test).
(Advanced)

S8.C.3.1.3 (Advanced) Explain that mechanical advantage helps to do work (physics) by either changing a force or changing the direction of the applied force (e.g., simple machines, hydraulic systems).

Topic: Density

Topic: pH

Topic: Heat Transfer

Unit: Forces and Interactions

Timeline: 4 Weeks

Unit Description:	Students are introduced to the 6 Natural Forces and what each one does. They then analyze different situations and objects to diagram the forces. After understanding of the forces is established, the forces are assigned quantitative values and students are tasked with predicting movement and acceleration of the objects. Students are also tasked with diagramming everyday object and showing how forces are interacting with them and the objects on a daily basis.
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STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.3 (Advanced) Principles of Motion and Force

S8.C.3.1 (Advanced)	Describe the effect of multiple forces on the movement, speed, or direction of an object.	
S8.C.3.1.1 (Advanced)	Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced).	
S8.C.3.1.3 (Advanced)	Explain that mechanical advantage helps to do work (physics) by either changing a force or changing the direction of the applied force (e.g., simple machines, hydraulic systems).	

Topic: Forces and Free Body Diagrams

Topic: Net Force

Topic: Speed, Velocity, & Acceleration

Unit: Laws of Motion

STANDARDS: STANDARDS

STATE: [Pennsylvania State Anchors \(2010\)](#)

S8.C.3 (Advanced) Principles of Motion and Force

Topic: Isaac Newton Facts and Discoveries

Unit: Energy

Timeline: 4 Weeks

Unit

Description: Students look at the movement of objects and begin to learn about Kinetic and Potential Energy. They do calculations of the energies and how they are present in everyday life. We look at the Law of Conservation of Energy and how energy is transferred to different types of energy such as Heat, Light, and Sound.

STANDARDS: STANDARDS

STATE: [Pennsylvania State Anchors \(2010\)](#)

S8.C.1 (Advanced) Structure, Properties, and Interaction of Matter and Energy

S8.C.1.1.3 (Advanced) Identify and describe reactants and products of simple chemical reactions.

S8.C.2 (Advanced) Forms, Sources, Conversion, and Transfer of Energy

S8.C.2.1 (Advanced) Describe energy sources, transfer of energy, or conversion of energy.

S8.C.2.1.1 (Advanced) Distinguish among forms of energy (e.g., electrical, mechanical, chemical, light, sound, nuclear) and sources of energy (i.e., renewable and nonrenewable energy)

S8.C.2.1.2 (Advanced) Explain how energy is transferred from one place to another through convection, conduction, or radiation.

S8.C.2.1.3 (Advanced) Describe how one form of energy (e.g., electrical, mechanical, chemical, light, sound, nuclear) can be converted into a different form of energy.

S8.C.2.2 (Advanced) Compare the environmental impact of different energy sources chosen to support human endeavors.

S8.C.2.2.1 (Advanced) Describe the Sun as the major source of energy that impacts the environment.

S8.C.3.1.2 (Advanced) Distinguish between kinetic and potential energy.

S8.C.3.1.3 (Advanced) Explain that mechanical advantage helps to do work (physics) by either changing a force or changing the direction of the applied force (e.g., simple machines, hydraulic systems).

Topic: Kinetic and Potential Energy

Topic: Simple Machines & Mechanical Advantage

Unit: MS Science Comprehensive Review

Timeline: 2 Weeks

Unit

Description: Prior to the 8th Grade Science PSSA, students spend some time reviewing key concepts from their 6th, 7th, and 8th grade years. We pull back examples of labs and topics that they have done in previous and current years. Students also study test taking skills such as reading

graphs and tables.

This Curriculum Map Unit has no Topics to display

Unit: Experimental Design

Timeline: 2 Weeks

Unit Description: In preparation for their 9th grade year, students are run through several inquiry based labs. Each lab is progressively more independent to help them establish the key concepts and steps to a successful inquiry. The final lab of the year is completely student driven and gives them a chance to exercise their curiosity by carrying out a full lab. This is done in cooperation with the HS Science 9th grade teachers in order to link students from their 8th grade to 9th grade educations.

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S8.A.1.3.3 (Advanced)	Examine systems changing over time, identifying the possible variables causing this change, and drawing inferences about how these variables affect this change.	
S8.A.1.3.4 (Advanced)	Given a scenario, explain how a dynamically changing environment provides for the sustainability of living systems.	
S8.A.2 (Advanced)	Processes, Procedures, and Tools of Scientific Investigations	
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(Advanced)	independent variables will be manipulated, how the dependent variable will be measured, and which variables will be held constant.	
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