



SOUTHERN LEHIGH SCHOOL DISTRICT
 5775 Main Street
 Center Valley, PA 18034

Scope and Sequence for **Kindergarten Science**

Pennsylvania Long-Term Transfer Goals for Science

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate systems, in order to connect how form determines function and how any change to one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Big Idea: Interactions between any two objects can cause changes in one or both of them.

Essential Question: How can one explain or predict interactions between objects within systems?

NGSS Performance Expectations	PA Academic Standards for Science*
<p><u>K-PS2 Motion and Stability: Forces and Interactions</u></p> <p>PS2.A: Forces and Motion K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.</p>	<p><u>3.2.B Physics</u></p> <p>1. Force & Motion of Particles and Rigid Bodies 3.2.1.B1 Demonstrate various types of motion. Observe and describe how pushes and pulls change the motion of objects. 3.2.3.B1 Explain how movement can be described in many ways. 3.2.4.B1 Explain how an object’s change in motion can be observed and measured.</p>
<p>Pennsylvania System of School Assessment (Grade 4 PSSA)* S4.C Physical Sciences</p>	
<p><u>S4.C.3 Principles of Motion and Force</u></p>	
<p>S4.C.3.1 Identify and describe different types of force and motion resulting from these forces, or the effect of the interaction between force and motion.</p>	<p>S4.C.3.1.1 Describe changes in motion caused by forces (e.g., magnetic, pushes or pulls, gravity, friction).</p>
	<p>S4.C.3.1.2 Compare the relative movement of objects or describe types of motion that are evident (e.g., bouncing ball, moving in a straight line, back and forth, merry-go-round).</p>

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Big Idea: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Essential Question: How is energy transferred and conserved?

NGSS Performance Expectations	PA Academic Standards for Science*
<p>K-PS3 Energy</p> <p>PS3.B: Conservation of Energy and Energy Transfer K-PS3-1 Make observations to determine the effect of sunlight on Earth’s surface K-PS3-2 Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.</p>	<p>3.2.B Physics</p> <p>3. Heat/Heat Transfer 3.2.K.B3** Describe how temperature can affect the body. 3.2.1.B3** Observe and record daily temperatures. Draw conclusions from daily temperature records as related to heating and cooling. 3.2.3.B3 Explore temperature changes that result from the addition or removal of heat.</p>
<p>Pennsylvania System of School Assessment (Grade 4 PSSA)* S4.A The Nature of Science</p>	
<p>S4.A.1 Reasoning and Analysis</p>	
<p>S4.A.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.</p>	<p>S4.A.1.3.3 Observe and describe the change to objects caused by temperature change or light.</p>
<p>Pennsylvania System of School Assessment (Grade 4 PSSA)* S4.C Physical Sciences</p>	
<p>S4.C.2 Forms, Sources, Conversion, and Transfer of Energy</p>	
<p>S4.C.2.1 Recognize basic energy types and sources, or describe how energy can be changed from one form to another.</p>	<p>S4.C.2.1.1 Identify energy forms, energy transfer, and energy examples (e.g., light, heat, electrical).</p>
	<p>S4.C.2.1.2 Describe the flow of energy through an object or system (e.g., feeling radiant heat from a light bulb, eating food to get energy, using a battery to light a bulb or run a fan).</p>
<p>Pennsylvania System of School Assessment (Grade 4 PSSA)* S4.D Earth and Space Sciences</p>	
<p>S4.D.2 Weather, Climate, and Atmospheric Processes</p>	
<p>S4.D.1.3 Identify basic weather conditions and how they are measured.</p>	<p>S4.D.2.1.2 Identify weather patterns from data charts or graphs of the data (e.g., temperature wind direction, wind speed, cloud types, precipitation).</p>
	<p>S4.D.2.1.3 Identify appropriate instruments (i.e., thermometer, rain gauge, weather vane, anemometer, and barometer) to study weather and what they measure.</p>

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Big Idea: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

Essential Question: How do organisms live, grow, respond to their environment, and reproduce?

NGSS Performance Expectations	PA Academic Standards for Science*
<p><u>K-LS1 From Molecules to Organisms: Structures and Processes</u></p> <p>LS1.C: Organization for Matter and Energy Flow in Organisms K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.</p> <p><u>K-ESS2 Earth’s Systems</u></p> <p>ESS2.D: Weather and Climate K-ESS2-2 Construction an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.</p> <p><i>This section continues on the next page.</i></p>	<p><u>3.1.A Organisms and Cells</u></p> <p>1. Common Characteristics of Life 3.1.K.A1** Identify the similarities and differences of living and non-living things.</p> <p>2. Energy Flow 3.1.1.A2 Investigate the dependence of living things on the sun’s energy, water, food/nutrients, air, living space, and shelter. 3.1.3.A2 Describe the basic needs of living things and their dependence on light, food, air, water, and shelter. 3.1.4.A2 Describe the different resources that plants and animals need to live.</p> <p><u>4.1 Ecology</u></p> <p>A. The Environment 4.1.1.A Identify and describe the basic needs of living things in a terrestrial habitat. 4.1.2.A Describe how a plant or an animal is dependent on living and nonliving things in an aquatic habitat.</p> <p>C. Energy Flow 4.1.3.C Identify sources of energy in an aquatic habitat. 4.1.3.C Identify sources of energy. 4.1.4.C Explain how most life on earth gets its energy from the sun.</p> <p><u>4.2 Watersheds and Wetlands</u></p> <p>C. Aquatic Ecosystem 4.2.K.C Identify that there are living and nonliving components in an aquatic habitat. 4.2.2.C Identify and describe the basic needs of plants and animals in an aquatic ecosystem.</p> <p><i>This section continues on the next page.</i></p>

NGSS Performance Expectations	PA Academic Standards for Science*
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Pennsylvania System of School Assessment (Grade 4 PSSA)*	
S4.A.3 Systems, Models, and Patterns	
S4.A.3.1 Identify systems and describe relationships among parts of a familiar system (e.g., digestive system, simple machines, water cycle).	S4.A.3.1.2 Explain a relationship between the living and nonliving components in a system (e.g., food web, terrarium).
Pennsylvania System of School Assessment (Grade 4 PSSA)	
S4.B.1 Structure and Function of Organisms	
S4.B.1.1 Identify and describe similarities and differences between living things and their life processes.	S4.B.1.1.3 Describe basic needs of plants and animals (e.g., air, water, food).

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Big Idea: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Essential Question: How and why do organisms interact with their environment and what are the effects of these interactions?

NGSS Performance Expectations	PA Academic Standards for Science*
<p><u>K-ESS3 Earth and Human Activity</u></p> <p>ESS3.A: Natural Resources K-ESS3-1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.</p>	<p><u>3.1.C Evolution</u></p> <p>2. Adaptation 3.1.K.C2 Describe changes animals and plants undergo throughout the seasons. 3.1.2.C2 Explain that living things can only survive if their needs are being met.</p> <p>3. Unifying Themes 3.1.K.C3 <u>CONSTANCY AND CHANGE</u> Describe changes that occur as a result of climate.</p> <p><u>4.1 Ecology</u></p> <p>E. Succession 4.1.K.E Identify how the changes of seasons affect their local environment. 4.1.1.E Describe the seasons and describe how the change of the season affects living things.</p>
<p>Pennsylvania System of School Assessment (Grade 4 PSSA)*</p>	
<p>S4.B Biological Sciences</p>	
<p>S4.B.3 Ecological Behavior and Systems</p>	
<p>S4.B.3.2 Describe, explain, and predict change in natural or human-made systems and the possible effects of those changes on the environment.</p>	<p>S4.B.3.2.3 Explain and predict how changes in seasons affect plants, animals, or daily human life (e.g., food availability, shelter, mobility).</p>

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Big Idea: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Essential Questions: How and why is the Earth constantly changing?

NGSS Performance Expectations	PA Academic Standards for Science*
<p><u>K-ESS2 Earth's Systems</u></p> <p>ESS2.D: Weather and Climate K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.</p> <p><u>K-ESS3 Earth and Human Activity</u></p> <p>ESS3.B: Natural Hazards K-ESS3-2 Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.</p>	<p><u>3.3.A Earth Structure, Processes and Cycles</u></p> <p>5. Weather and Climate 3.3.K.A5 Record daily weather conditions using simple charts and graphs. Identify seasonal changes in the environment. Distinguish between types of precipitation. 3.3.1.A5 Become familiar with weather instruments. Collect, describe, and record basic information about weather over time. 3.3.4.A5 Describe basic weather elements. Identify weather patterns over time.</p>
<p>Pennsylvania System of School Assessment (Grade 4 PSSA)* S4.D Earth and Space Sciences</p>	
<p>S4.D.2 Weather, Climate, and Atmospheric Processes</p>	
<p>S4.D.1.3 Identify basic weather conditions and how they are measured.</p>	<p>S4.D.2.1.1 Identify basic cloud types (i.e., cirrus, cumulus, stratus, and cumulonimbus) and make connections to basic elements of weather (e.g., changes in temperature, precipitation).</p> <p>S4.D.2.1.2 Identify weather patterns from data charts or graphs of the data (e.g., temperature wind direction, wind speed, cloud types, precipitation).</p> <p>S4.D.2.1.3 Identify appropriate instruments (i.e., thermometer, rain gauge, weather vane, anemometer, and barometer) to study weather and what they measure.</p>

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Big Idea: The Earth’s surface processes affect and are affected by human activities.

Essential Questions: How do Earth’s processes and human activities affect each other?

NGSS Performance Expectations	PA Academic Standards for Science*
<p><u>K-ESS2 Earth’s Systems</u></p> <p>ESS2.D: Weather and Climate K-ESS2-2 Construction an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.</p> <p><u>K-ESS3 Earth and Human Activity</u></p> <p>ESS3.C: Human Impacts on Earth Systems K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.</p>	<p><u>3.3.A Earth Structure, Processes, and Cycles</u></p> <p>4. Water 3.3.K.A4 Identify sources of water for human consumption and use.</p> <p><u>4.3 Natural Resources</u></p> <p>D. Waste Management 4.5.K.D Identify waste and practice ways to reduce, reuse, and recycle. 4.5.1.D Identify where waste from the home, school and community goes for disposal. 4.5.2.D Describe how people can help the environment by reducing, reusing recycling, and composting. 4.5.3.D Describe how waste is generated. Identify and propose a solution for a waste issue in the school setting (e.g., litter in the hallways).</p>
<p>Pennsylvania System of School Assessment (Grade 4 PSSA)*</p>	
<p>S4.D Earth and Space Sciences</p>	
<p><u>S4.D.1 Earth Features and Processes that Change Earth and Its Resources</u></p>	
<p>S4.D.1.2 Identify the types and uses of Earth’s resources.</p>	<p>S4.D.1.2.3 Recognize ways that humans benefit from the use of water resources (e.g., agriculture, energy, recreation).</p>

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Pennsylvania Inquiry and Design Practices (Grades K-2)*

Asking questions and defining problems

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Ask and/or identify questions that can be answered by an investigation.
- Define a simple problem that can be solved through the development of a new or improved object or tool.

Developing and using models

- Distinguish between a model and the actual object, process, and/or events that model represents.
- Compare models to identify common features and differences.
- Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).

Planning and carrying out investigations

- With guidance, plan and conduct an investigation in collaboration with peers.
- Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.
- Make observations (first hand or from media) and/or measurements to collect data that can be used to make comparisons.
- Make observations (first hand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.
- Make predictions based on prior experiences.

Constructing explanations and designing solutions

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.
- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.
- Generate and/or compare multiple solutions to a problem.

Analyzing and interpreting data

- Record information (observations, thoughts, and ideas).
- Use and share pictures, drawings, and/or writings of observations.
- Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.
- Compare predictions (based on prior experiences) to what occurred (observable events).
- Analyze data from tests of an object or tool to determine if it works as intended.

Using mathematics and computational thinking

- Decide when to use qualitative vs. quantitative data.
- Use counting and numbers to identify and describe patterns in the natural and designed world(s).
- Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.
- Use quantitative data to compare two alternative solutions to a problem.

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Pennsylvania Inquiry and Design Practices (Grades K-2)*

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Engaging in argument from evidence

- Identify arguments that are supported by evidence.
- Distinguish between explanations that account for all gathered evidence and those that do not.
- Analyze why some evidence is relevant to a scientific question and some is not.
- Distinguish between opinions and evidence in one/s own explanations.
- Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument.
- Construct an argument with evidence to support a claim.
- Make a claim about the effectiveness of an object, too, or solution that is supported by relevant evidence.

Obtaining, evaluating, and communicating information

- Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).
- Describe how specific images (e.g. a diagram showing how a machine works) support a scientific or engineering idea.
- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.
- Communicate information or design ideas and/or solutions with others in oral and/or numbers that provide detail about scientific ideas, practices, and/or design ideas.

Pennsylvania System of School Assessment (Grade 4 PSSA)*

S4.A The Nature of Science

S4.A.1 Reasoning and Analysis

S4.A.1.1

Identify and explain the application of scientific, environmental, or technological knowledge to possible solutions to problems.

S4.A.1.1.1

Distinguish between a scientific fact and an opinion, providing clear explanations that connect observations and results (e.g., a scientific fact can be supported by making observations).

S4.A.1.3

Recognize and describe change in natural or human-made systems and the possible effects of those changes.

S4.A.1.3.1

Observe and record change by using time and measurement.

S4.A.1.3.2

Describe relative size, distance, or motion.

S4.A.2 Processes, Procedures, and Tools of Scientific Investigations

S4.A.2.1

Apply skills necessary to conduct an experiment or design a solution to solve a problem.

S4.A.2.1.1

Generate questions about objects, organisms, or events that can be answered through scientific investigations.

S4.A.2.1.2

Design and describe an investigation (a fair test) to test one variable.

S4.A.2.1.3

Observe a natural phenomenon (e.g., weather changes, length of daylight/night, movement of shadows, animal migrations, growth of plants), record observations, and then make a prediction based on those observations.

S4.A.2.1.4

State a conclusion that is consistent with the information/data.

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Pennsylvania Inquiry and Design Practices (Grades K-2)*

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Pennsylvania System of School Assessment (Grade 4 PSSA)*		S4.A The Nature of Science
S4.A.2 Processes, Procedures, and Tools of Scientific Investigations		
S4.A.2.2 Identify appropriate instruments for a specific task and describe the information the instrument can provide.	S4.A.2.2.1 Identify appropriate tools or instruments for specific tasks and describe the information they can provide (e.g., measuring: length – ruler, mass – balance scale, volume – beaker, temperature – thermometer; making observations: hand lens, binoculars, telescope).	
S4.A.3 Systems, Models, and Patterns		
S4.A.3.2 Use models to illustrate simple concepts and compare the models to what they represent.	S4.A.3.2.1 Identify what different models represent (e.g., maps show physical features, directions, distances; globes represent Earth; drawings of watershed depict terrain; dioramas show ecosystems; concept maps show relationships of ideas).	
	S4.A.3.2.2 Use models to make observations to explain how systems work (e.g., water cycle, Sun-Earth-Moon system).	
	S4.A.3.2.3 Use appropriate, simple modeling tools and techniques to describe or illustrate a system (e.g., two cans and string to model a communications system, terrarium to model an ecosystem).	
S4.A.3.3 Identify and make observations about patterns that regularly occur and reoccur in nature.	S4.A.3.3.1 Identify and describe observable patterns (e.g., growth patterns in plants, weather, water cycle).	
	S4.A.3.3.2 Predict future conditions/events based on observable patterns (e.g., day/night, seasons, sunrise, lunar phases).	

Big Ideas	Essential Questions
Big Idea 1: Asking questions and defining problems are essential to developing scientific habits of mind.	What kinds of questions do scientists and engineers ask?
Big Idea 2: Scientists construct mental and conceptual models of phenomena to represent current understandings, aid in developing questions and experiments, and to communicate ideas to others.	How do scientists and engineers develop and use models?
Big Idea 3: Scientists and engineers plan and investigate the world to systematically describe it and to develop and test theories and explanations about how the world works.	What do scientists and engineers do to find out more about our world and how it functions?
Big Idea 4: Data must be presented in a form that can reveal any patterns and relationships and that allows results to be communicated to others.	In what ways are data analyzed, interpreted, and communicated?
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Pennsylvania Inquiry and Design Practices (Grades K-2)*

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Big Idea 5: Mathematics enables numerical representation of variables, symbolic representation of relationships between physical entities, and prediction of outcomes.	How is mathematics utilized in doing science?
Big Idea 6: Scientific theories are developed to provide explanations about the nature of particular phenomena, predict future events, or make inferences about past events.	Why are theories valuable constructs in helping scientists understand and explain our world?
Big Idea 7: Scientists and engineers use reasoning and argumentation to make a justified claim about the world.	How do scientists and engineers communicate to others in order to advance science and engineering?
Big Idea 8: Science and engineering are ways of knowing that are represented and communicated by words, diagrams, charts, graphs, images, symbols, and mathematics.	In what ways do scientists and engineers communicate their knowledge?

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