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

Scope and Sequence for **Grade 2 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: Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.
Essential Question: How can one explain the structure, properties, and interactions of matter?

NGSS Performance Expectations	PA Academic Standards for Science*
2-PS1 Matter and Its Interactions **PS1.A: Structure and Properties of Matter** **2-PS1-1** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. **2-PS1-2** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. **2-PS1-3** Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. **PS1.B: Chemical Reactions** **2-PS1-4** Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. ***This section continues on the next page.***	**3.2.A Chemistry** **1. Properties of matter** **3.2.K.A1** Identify and classify objects by observable properties of matter. Compare different kinds of materials and discuss their uses. **3.2.1.A1** Observe and describe the properties of liquids and solids. Investigate what happens when solids are mixed with water and other liquids are mixed with water. **3.2.3.A1**** Differentiate between properties of objects such as size, shape, weight, and properties of materials that make up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying solid, liquid, or gas. **3.2.4.A1**** Identify and classify objects based on their observable and measurable physical properties. Compare and contrast solids, liquids, and gases based on their properties. **3.2.5.A1** Describe how water can be changed from one state to another by adding or taking away heat. **2. Structure of Matter** **3.2.3.A2** Recognize that all objects and materials in the world are made of matter. ***This section continues on the next page.***

NGSS Performance Expectations	PA Academic Standards for Science*
Continued…	***Continued…*** **3. Matter & Energy** **3.2.K.A3**** Describe the way matter can change. **3.2.1.A3**** Identify how heating, melting, cooling, etc. may cause changes in properties of materials. **3.2.2.A3**** Demonstrate how heating and cooling may cause changes in the properties of materials. **3.2.3.A3**** Demonstrate how heating and cooling may cause changes in the properties of materials including phase changes. **4. Reactions** **3.2.1.A4** Observe and describe what happens when substances are heated and cooled. Distinguish between changes that are reversible (melting, freezing) and not reversible (e.g. baking a cake, burning fuel). **3.2.2.A4** Experiment and explain what happens when two or more substances are combined (e.g. mixing, dissolving, and separated (e.g. filtering, evaporation). **5. Unifying Themes** **3.2.2.A5** CONSTANCY AND CHANGE Recognize that everything is made of matter. **3.2.4.A5**** MODELS Use models to demonstrate the physical change as water goes from liquid to ice and from liquid to vapor.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
S4.A.1 Reasoning and Analysis	
S4.A.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.	**S4.A.1.3.3** Observe and describe the change to objects caused by temperature change or light.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.C Physical Sciences
S4.C.1 Structure, Properties, and Interaction of Matter and Energy	
S4.C.1.1 Describe observable physical properties of matter.	**S4.C.1.1.1** Use physical properties [e.g., mass, shape, size, volume, color, texture, magnetism, state (i.e., solid, liquid, and gas), conductivity (i.e., electrical and heat)] to describe matter.
	S4.C.1.1.2 Categorize/group objects using physical characteristics.

* Students are working towards mastery of the listed PA Academic Standards and Grade 4 Science PSSA Eligible Content.
** Indicates that there will be no additional formal instruction on the standard or eligible content, other than review, prior to the Grade 4 Science PSSA.

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*
2-LS2 Ecosystems: Interactions, Energy, Dynamics **LS2.A: Interdependent Relationships in Ecosystems** **2-LS2-1** Plan and conduct an investigation to determine if plants need sunlight and water to grow. **2-LS2-2** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. ***This section continues on the next page…***	**3.1.A Organisms and Cells** **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. **3.1.5.A2** Describe how life on earth depends on energy from the sun. **3. Life Cycles** **3.1.K.A3** Observe, compare, and describe stages of life cycles for plants and/or animals. **3.1.2.A3** Identify similarities and differences in the life cycles of plants and animals. **3.1.3.A3** Illustrate how plants and animals go through predictable life cycles that include birth, development, reproduction, and death. **3.1.4.A3** Identify differences in the life cycles of plants and animals. **3.1.5.A3** Compare and contrast the similarities and difference in life cycles of different organisms. **5. Form and Function** **3.1.K.A5** Observe and describe structures and behaviors of a variety of common animals. **3.1.1.A5** Identify and describe plant parts and their function. **3.1.2.A5** Explain how different parts of a plant work together to make the organism function. **3.1.3.A5** Identify the structures in plants that are responsible for food production, support, water transport, reproduction, growth, and protection. **3.1.4.A5** Describe common functions living things share to help them function in a specific environment. **8. Unifying Themes** **3.1.4.A8** MODELS Construct and interpret models and diagrams of various animal and plant life cycles. ***This section continues on the next page…***

NGSS Performance Expectations	PA Academic Standards for Science*
Continued…	***Continued…*** **<u>4.1 Ecology</u>** **C. Energy Flow** **4.1.3.C** Identify sources of energy. **4.1.4.C** Explain how most life on earth gets its energy from the sun. **<u>4.4 Agriculture and Society</u>** **C. Applying Sciences to Agriculture** **4.4.K.C** Observe and describe stages of life cycles for plants and animals. **4.4.1.C** Describe the life cycles of different plants and animals in terrestrial habitats. **4.4.3.C** Use scientific inquiry to investigate what animals and plants need to grow.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
S4.A.1 Reasoning and Analysis	
S4.A.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.	**S4.A.1.3.4** Explain what happens to a living organism when its food supply, access to water, shelter, or space is changed (e.g., it might die, migrate, change behavior, eat something else).
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.B Biological Sciences
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.1.1.1** Identify life processes of living things (e.g., growth, digestion, respiration).
	S4.B.1.1.2 Compare similar functions of external characteristics of organisms (e.g., anatomical characteristics: appendages. Type of covering, body segments).
	S4.B.1.1.3 Describe basic needs of plants and animals (e.g., air, water, food).
	S4.B.1.1.4 Describe how different parts of living thing work together to provide what the organism needs (e.g., parts of plants: roots, stems, leaves).
	S4.B.1.1.5 Describe the life cycles of different organisms (e.g., moth, grasshopper, frog, seed-producing plant).

* Students are working towards mastery of the listed PA Academic Standards and Grade 4 Science PSSA Eligible Content.
** Indicates that there will be no additional formal instruction on the standard or eligible content, other than review, prior to the Grade 4 Science PSSA.

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*
2-LS4 Biological Evolution: Unity and Diversity **LS4.D: Biodiversity and Humans** **2-LS4-1** Make observations of plants and animals to compare the diversity of life in different habitats.	**3.1.C Evolution** **1. Natural Selection** **3.1.3.C1** Recognize that plants survive through adaptations, such as stem growth towards light and root growth downward in response to gravity. Recognize that many plants and animals can survive harsh environments because of seasonal behaviors (e.g. hibernation, migration, trees shedding leaves). **3.1.4.C1** Identify different characteristics of plants and animals that help some populations survive and reproduce in greater numbers. Describe how environmental changes can cause extinction in plants and animals. **2. Adaptation** **3.1.2.C2** Explain that living things can only survive if their needs are being met. **3.1.3.C2** Describe animal characteristics that are necessary for survival. **3.1.4.C2** Describe plant and animal adaptations that are important to survival. **3. Unifying Themes** **3.1.K.C3**** CONSTANCY AND CHANGE Describe changes that occur as a result of climate. **3.1.1.C3** CONSTANCY AND CHANGE Describe changes that occur as a result of habitat.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
S4.A.1 Reasoning and Analysis	
S4.A.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.	**S4.A.1.3.4** Explain what happens to a living organism when its food supply, access to water, shelter, or space is changed (e.g., it might die, migrate, change behavior, eat something else).
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.B Biological Sciences
S4.B.2 Continuity of Life	
S4.B.2.1 Identify and explain how adaptations help organisms to survive.	**S4.B.2.1.1** Identify characteristics for plant and animal survival in different environments (e.g., wetland, tundra, desert, prairie, deep ocean, forest.)
	S4.B.2.1.2 Explain how specific adaptations can help a living organism survive (e.g., protective coloration, mimicry leaf sizes and shapes, ability to catch or retain water.)

* Students are working towards mastery of the listed PA Academic Standards and Grade 4 Science PSSA Eligible Content.
** Indicates that there will be no additional formal instruction on the standard or eligible content, other than review, prior to the Grade 4 Science PSSA.

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*
2-ESS1 Earth's Place in the Universe **ESS1.C: The History of Planet Earth** **2-ESS1-1** Use information from several sources to provide evidence that Earth events can occur quickly or slowly. **2-ESS2 Earth's Systems** **ESS2.A: Earth Materials and Systems** **2-ESS2-1** Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. **ESS2.B: Plate Tectonics and Large Scale System Interactions** **2-ESS2-2** Develop a model to represent shapes and kinds of land and bodies of water in an area **ESS2.C: Roles of Water in Earth's Surface Processes** **2-ESS2-3** Obtain information to identify where water is found on Earth and that it can be solid or liquid. ***This section continues on the next page…***	**3.3.A Earth Structure, Processes and Cycles** **1. Earth Features and the Processes that Change It** **3.3.K.A1** Distinguish between three types of earth materials – rock, soils, and sand. **3.3.1.A1** Observe, describe and sort earth materials. Compare the composition of different soils. **3.3.3.A1** Explain and give examples of the ways in which soil is formed. **3.3.4.A1** Describe basic landforms. Identify the layers of the earth. Recognize that the surface of earth changes due to slow processes and rapid processes. **3.3.5.A1** Describe how landforms are the result of a combination of destructive forces such as erosion and constructive erosion, deposition of sediment, etc. **2. Earth's Resources/Materials** **3.3.3.A2** Identify the physical properties of minerals and demonstrate how minerals can be tested for these different physical properties. **3.3.4.A2** Identify basic properties and uses of Earth's materials including rocks, soils, water, and gases of the atmosphere. **3. Earth's History** **3.3.5.A3** Explain how geological processes observed today such as erosion movement of lithospheric plates, and changes in the composition of the atmosphere are similar to those in the past. **4. Water** **3.3.1.A4** Identify and describe types of fresh- and salt-water bodies (ocean, rivers, lakes, ponds). **3.3.2.A4** Explore and describe that water exists in solid (ice) and liquid) form. Explain and illustrate evaporation and condensation. ***This section continues on the next page…***

NGSS Performance Expectations	PA Academic Standards for Science*
Continued…	***Continued…***
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.D Earth and Space Sciences
S4.D.1 Earth Features and Processes that Change Earth and Its Resources	
S4.D.1.1 Describe basic landforms in Pennsylvania.	**S4.D.1.1.1** Describe how prominent Earth features in Pennsylvania (e.g., mountains valleys, caves, sinkholes, lakes, rivers) were formed.
	S4.D.1.1.3 Describe the composition of soli as weathered rock and decomposed organic remains.
S4.D.1.2 Identify the types and uses of Earth's resources.	**S4.D.1.2.2** Identify the types and uses of Earth materials for renewable, nonrenewable, and reusable products (e.g., human-mad products: concrete, paper, plastics, fabrics).
	S4.D.1.2.3 Recognize ways that humans benefit from the use of water resources (e.g., agriculture, energy, recreation).
S4.D.1.3 Describe Earth's different sources of water or describe changes in the form of water.	**S4.D.1.3.1** Describe types of freshwater and saltwater bodies (e.g., lakes, rivers, wetlands, oceans).

* Students are working towards mastery of the listed PA Academic Standards and Grade 4 Science PSSA Eligible Content.
** Indicates that there will be no additional formal instruction on the standard or eligible content, other than review, prior to the Grade 4 Science PSSA.

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.

This section continues on the next page…

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

Continued…

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.

This section continues on the next page…

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

Continued…

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?

This section continues on the next page…

This section continues on the next page…

Pennsylvania Inquiry and Design Practices (Grades K-2)*	
Continued… **Big Idea 5:** Mathematics enables numerical representation of variables, symbolic representation of relationships between physical entities, and prediction of outcomes.	***Continued…*** 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?

* Students are working towards proficiency in the Pennsylvania Inquiry Design Practices and mastery of the listed PA Academic Standards and Grade 4 Science PSSA Eligible Content. The classroom application of the Inquiry and Design Practices should be age appropriate.
** Indicates that there will be no additional formal instruction on the eligible content, other than review, prior to the Grade 4 Science PSSA.