SCIENCE

LENGTH OF TIME: one year

GRADE LEVEL: 5

DESCRIPTION OF COURSE:
This course is broken into two units.

1) Modeling Matter: The Chemistry of Food unit will help students master disciplinary core ideas in physical science while supporting students' development of key science practices such as developing and using models and constructing scientific explanations. The unit incorporates an explicit focus on the crosscutting concept of Scale, Proportion, and Quantity, with opportunities to address the crosscutting concepts of Energy and Matter, Stability and Change, and Patterns.

2) The Earth System: Investigating Water Shortages unit will help students master disciplinary core ideas in Earth and physical science while supporting students' development of key science practices such as developing and using models and constructing explanations and designing solutions. The unit incorporates an explicit focus on the crosscutting concept of Systems and System Models, with opportunities to address the crosscutting concepts of Scale, Proportion, and Quantity and Energy and Matter.

Both units provide substantial experience with Pennsylvania's Common Core State Standards (PACCSS) for English Language Arts (ELA) as they relate to reading and writing informational text. The unit includes opportunities to address some PACCSS for Mathematics, with optional extensions that allow further standards coverage.

COURSE STANDARDS:
PA Academic Standards for Science and Technology and Engineering Education (Grades 3, 5, 6, 8)

A. Biological Sciences (3.1)

Students will:

1. Describe how energy derived from the sun is used by plants to produce sugars and is transferred within a food chain from producers to consumers to decomposers. (3.1.6.A2)
2. Describe how organisms obtain and use energy throughout their lives.

B. Physical Sciences (3.2)

Students will:

1. Recognize that combining two or more substances may make new materials with different properties (3.2.3.A4)
2. Identify and classify objects based on their observable and measurable physical properties. (3.2.4.A1)
3. Demonstrate that materials are composed of parts that are too small to be seen without magnification. (3.2.4.A2)
4. Compare and contrast pure substances with mixtures (3.2.6.A2)

5. Identify atoms as the basic building blocks of matter and that elements are composed of one type of atom. (3.2.7.A2)
6. Describe how energy can be changed from one form to another as it moves through a system or transferred from one system to another system. (3.2.7.B2)

A. Science as inquiry (4.1.5F, 4.2.5D, 4.3.5.C, 4.4.5.E, 4.5.5.F)

PA Academic Standards for Environment and Ecology (Grades 3-8, 10, 12)
Ecology 4.1
Students will:

1. Explain how matter cycles through an ecosystem. (4.1.4.B)
2. Explain the flow of energy within an ecosystem. (4.1.7.C)
3. Identify factors that contribute to change in natural and human-made systems. (4.1.7.E)

PERFORMANCE ASSESSMENTS:

1) Modeling Matter

- Develop a model to describe that matter is made of particles too small to be seen.
- Make observations and measurements to identify materials based on their properties.
- Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

2) The Earth System

- Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
- Develop a model to describe that matter is made of particles too small to be seen.
- Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- Make observations and measurements to identify materials based on their properties.
- Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
- Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

- Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

TITLES OF UNITS:

1. Modeling Matter Marking Period 1
2. The Earth System Marking Period 2

SAMPLE INSTRUCTIONAL STRATEGIES:
Each fifth grade unit contains an extensive selection of varied instructional strategies for the teacher to integrate into the classroom.

MATERIALS:

1. Materials contained in each Amplify kit
2. Chromebooks for simulations

METHODS OF ASSISTANCE AND ENRICHMENT:

1. Peer assistance/parent helpers
2. Special projects
3. Cooperative groups

METHODS OF EVALUATION:

1. Completed Investigation Notebook pages
2. Critical juncture assessments
3. End of unit assessment

INTEGRATED ACTIVITIES/CROSS CUTTING CONCEPTS

1) Modeling Matter
    - Do. Students count the number of drops of a liquid that can stay on a penny and observe the shape of the liquid on the coin to notice that some liquids hold together better than others. Then, students engage in the All Aboard Model, as individual students (representing individual molecules of a liquid) attempt to all stand in a designated square on the floor (representing the penny). Students discover that when they hold on to one another, more students can fit in the square. They reflect on what this could indicate about the molecules in liquids that hold together well as compared to liquids that don't hold together as well.
    - Talk. Multiple opportunities for student-to-student talk engage the class in figuring out what they can infer about the properties of molecules, based on the observable properties of substances.
    - Read. Students read a book about the concept that everything is made of atoms and molecules, and they reflect on the relative size of these particles that are too small to see.
    - Write. During the course of the unit, students write several scientific explanations about changes that occur when they make or separate mixtures; they describe various phenomena at both the molecular level and at the observable scale.

- Visualize. Through developing models, students work to visualize the properties of molecules and how those properties affect the observable interactions of substances.

2) The Earth System
   - Do. Students design and construct freshwater collection systems, a potential solution to the water shortage in the fictional city of East Ferris. As they design, test, and refine their systems, students closely analyze the role that each part of their system plays and how to revise their systems to better meet their design criteria.
   - Talk. Multiple opportunities for student-to-student talk engage the class in figuring out what role Earth's spheres play in rain formation and how spheres interact with one another during that process.
   - Read. Students read a book about how Earth's spheres interacted when the dinosaurs went extinct and apply this understanding to explain how Earth's spheres interact during rain formation.
   - Write. During the course of the unit, students write several scientific explanations about rain formation. These explanations require students to apply a system-level understanding of the interactions of Earth's spheres to explain how rain forms.
     •Visualize. As students develop and use models, they visualize nanoscale interactions that occur during condensation and evaporation.