Southern York County School District Instructional Plan

Name:	Dates: Rotating Basis
Course/Subject: Science, Grade 6	Unit Plan: Mixtures and Solutions

Stage 1 – Desired Results

PA Standard(s)/Assessment Anchors Addressed:

S8.A.1 1 **Explain, interpret, and apply scientific, environmental, or technological knowledge presented in a variety of formats (e.g., visuals, scenarios, graphs).**

Reference: 3.2.7.A, 3.2.7.B

S8.A.1.3 **Identify and analyze evidence that certain variables may have caused measurable changes in natural or human-made systems.**

Reference: 3.1.7.E, 4.7.7.C, 4.8.7.C

S8.A.2.1 **Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.**

Reference: 3.2.7.B, 3.2.7.D, 3.1.7.C, 3.1.7.D

S8.A.2.2 **Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.**

Reference: 3.3.7.A, 3.7.7.B, 3.1.7.D

S8.A.3.2 **Apply knowledge of models to make predictions, draw inferences, or explain technological concepts.**

Reference: 3.1.7.B, 3.2.7.B, 4.1.7.B

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

Reference: 3.4.7.A

Understanding(s):
Students will understand . . .

1. Mixtures contain two or more materials that retain their own properties.
2. A solution forms when a material dissolves in a liquid (solvent) and cannot be retrieved with a filter.
3. Evaporation can separate a liquid from a solid in a solution.
4. Solubility is the property that substances have of dissolving in solvents. Solubility is different for different materials and can change with temperature and different solvents.
5. Concentration expresses a relationship between the amount of dissolved material and the volume of solvent.
6. When a change results from mixing two or more materials, that change is a chemical reaction. A reaction results in new materials.
7. Not all chemicals react when they are mixed.

Essential Question(s):

- How can a mixture be separated?
- How can a solution be separated?
- Is there a limit to how much can be dissolved in water?
- Can an unknown chemical be identified by its solubility?
- How can you determine that solutions are more concentrated?
- How can you tell whether three solutions have different concentrations?
- How do you know when a chemical reaction has occurred?
- Can the products of a chemical reaction be separated for further study?
- What might happen if you conduct a gas-producing reaction in closed bag?

Learning Objectives: ***Students will know . . .***	***Students will be able to:***
▪ The solid material separated by evaporation from a solution forms distinctive patterns. ▪ A solution is saturated when as much solid material as possible has dissolved in the liquid. ▪ When equal volumes of two solutions made from the same ingredients are compared, the heavier one is the more concentrated solution. ▪ The more material dissolved in a liquid, the more concentrated the solution. ▪ A concentrated solution can be made more dilute by adding solvent to the solution. ▪ Formation of a gas is one change that occurs in some reactions. ▪ Formation of a precipitate occurs in some chemical reactions. ▪ Water and salt make a special kind of mixture, a solution that cannot be separated with a filter but only through evaporation. ▪ How to make a saturated citric-acid solution. ▪ The properties of solubility can be used to identify unknown materials. ▪ The relative concentration of solid material and solution can be measured. ▪ The changes (formation of a gas and a white precipitate) are identified as chemical reactions.	▪ Make mixtures of water and solid materials (salt, gravel, and diatomaceous earth) and separate the mixtures with screens and filters. ▪ Use the property of solubility to identify unknown materials. ▪ Make a saturated solution by adding salt to water until no more salt will dissolve. ▪ Use a balance to compare the solubility of the two solid materials by comparing the mass of the salt and citric acid dissolved in the saturated solutions. ▪ Observe and compare soft-drink solutions that differ in the amount of powder (water held constant) and that differ in the amount of water (powder held constant) to develop the concept of concentration. ▪ Make salt solutions of different concentrations and compare them, using a balance. ▪ Systematically mix combinations of solid materials (calcium chloride, baking soda, and citric acid) with water and observe changes that occur. ▪ Determine the amount of citric acid needed to saturate 50 ml of water.
Name:	**Dates: Rotating Basis**
Course/Subject: Science, Grade 6	**Unit Plan: Models and Designs**

Stage 1 – Desired Results	
PA Standard(s)/Assessment Anchors Addressed: **S8.C.3.1** **Describe the effect of multiple forces on the movement, speed, or direction of an object.** **Eligible Content:** **S8.C.3.1** **Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced).** **S8.A.3.2** **Apply knowledge of models to make predictions, draw inferences, or explain technological concepts.** **Eligible Content:** **S8.A.3.2.2** **Describe how engineers use models to develop new and improved technologies to solve problems.** **S8.A.2.1** **Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.** **Eligible Content:** **S8.A.2.1.1** **Use evidence, observations, or a variety of scales (e.g., mass, distance, volume, temperature) to describe relationships.** **S8.A.2.1.2** **Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.** **S8.A.2.1.4** **Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.** **S8.A.2.1.5** **Use evidence from investigations to clearly communicate and support conclusions.** **S8.A.2.2** **Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.** **Eligible Content:** **S8.A.2.2.1** **Describe the appropriate use of instruments and scales to accurately and safely measure time, mass, distance, volume, or temperature under a variety of conditions.**	
Understanding(s): ***Students will understand . . .*** 1. A model is a representation or explanation of how something looks or works. There are two types of models, physical and conceptual. 2. Engineers use scientific principles and knowledge to design useful products. 3. There is a process in which new designs and technologies are created.	**Essential Question(s):** ▪ What evidence can you acquire that will help you explain what a black box looks like inside? ▪ How can you build a physical model of a black box that behaves the same way? ▪ How can you draw a model that explains how a drought stopper works? ▪ How can you make a model that hums when you pull the string and dings when you let it go? ▪ How can you improve your model? ▪ How was the original hum dinger constructed? ▪ How can you design a go-cart that can roll down a ramp and across the floor a short distance? ▪ How can you modify your go-cart so that it will travel 2 meters on level ground without an external push or pull? ▪ What factors go into the design of a self-powered go-cart that can travel 2

	meters? ▪ How can you design a car that can turn a corner as well as travel 2 meters? ▪ How can you modify your cart to perform additional tricks? ▪ What other models can you design?
Learning Objectives: ***Students will know . . .*** ▪ Scientists develop models to explain how systems work. ▪ Models can be communicated through words and drawings, or can be physical and demonstrable. ▪ Scientists construct physical models to explain how something works or how it is constructed. ▪ Scientists collaborate on finding solutions to problems. ▪ Electric devices need a complete circuit in order to work. ▪ Levers are used to move objects. ▪ A variety of designs may solve the same problem. ▪ The way something is put together is its design. ▪ Using scientific principles and knowledge to design useful products is the work of engineers. ▪ Some land vehicles have wheels fixed to axles. Power turns the axle and thereby turns the wheels. ▪ Systems can be designed to perform specific functions. ▪ Application of science for the benefit of people is called technology and is the work of engineers. ▪ Problem solving involves designing, constructing, testing, evaluating, and redesigning based on evidence from testing. ▪ A variable is anything you can change in a design that might affect the performance of the product.	***Students will be able to:*** ▪ Use multi-sensory observations of sealed black boxes to develop conceptual models. ▪ Construct physical models of the black boxes. ▪ Draw models to explain how they think a device works. ▪ Work in collaborative groups to design and build a physical model of a hum dinger. ▪ Compare its performance to the real hum dinger. ▪ Observe, design, test, compare, and redesign until they engineer a successful model of a hum dinger. ▪ Construct the same design of the real hum dinger. ▪ Design and construct a rolling cart using common construction materials. ▪ Design and construct a self-propelled cart that can travel 2 meters. ▪ Work collaboratively to modify their self-propelled carts to turn a corner. ▪ Work collaboratively to modify their self-propelled carts to perform maneuvers. ▪ Identify the relationships among go-cart variables and their performances.

Name:	**Dates: Rotating Basis**
Course/Subject: Science, Grade 6	**Unit Plan: Landforms**

Stage 1 – Desired Results	
PA Standard(s)/Assessment Anchors Addressed: **S8.D.1.3** **Describe characteristic features of Earth's water systems or their impact on resources.** **Eligible Content:** **S8.D.1.3.3** **Distinguish among different water systems (e.g., wetland systems, ocean systems, river systems, watersheds) and describe their relationships to each other as well to and forms.** **S8.D.1.1** **Describe constructive and destructive natural processes that form different geologic structures and resources.** **Eligible Content:** **S8.D.1.1.2** **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.A.3.2** **Apply knowledge of models to make predictions, draw inferences, or explain technological concepts.** **Eligible Content:** **S8.A.3.2.1** **Describe how scientists use models to explore relationships in natural systems (e.g., an ecosystem, river system, the solar system).** **S8.A.2.1** **Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.** **Eligible Content:** **S8.A.2.1.2** **Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.** **S8.A.2.1.4** **Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.** **S8.A.2.1.5** **Use evidence from investigations to clearly communicate and support conclusions.**	
Understanding(s): ***Students will understand . . .*** 1. Models represent objects that are very large or processes that occur over long periods of time. 2. Water is an important agent in shaping landforms. 3. Variables, such as the slope of the land, the rate of water, and humans, affect the processes of erosion and deposition. 4. Topographic maps are two-dimensional representations of three-dimensional surfaces.	**Essential Question(s):** ▪ How is model used to represent something in the real world? ▪ How is a model like the real thing and how is it different? ▪ How is a map like a model? ▪ How is a map different from a model? ▪ How can you change the size of a map without changing the information given? ▪ What happens when water flows over earth materials? ▪ What happens to the earth materials eroded by water? ▪ How does the size of a particle affect deposition? ▪ How is the flow of a stream affected by erosion and deposition? ▪ How does the slope of the stream table affect erosion and deposition? ▪ How does the amount of water that flows through a stream affect erosion and deposition? ▪ What variable can you test to find out more about stream processes?

- How can we make a map that depicts different elevations of a mountain?
- How can we draw the profile of a mountain from a topographic map?
- What information can we get from a topographic map?
- How do you read a topographic map?
- What do the symbols, colors, and textures on a topographic map mean?
- What are the similarities and differences between a topographic map and an aerial photo of the same area?
- How can you make a map from an aerial photograph?

Learning Objectives:
Students will know . . .

- A model can represent landforms and human structures.
- Maps can be generated from models.
- A map can represent landforms and human structures.
- A cartographer is a person who constructs maps.
- Maps can be transferred from one scale to another.
- Maps have certain advantages over models.
- A landform is a shape of the land.
- Erosion involves two processes: weathering and transporting.
- Deposition is the process by which eroded earth materials settle out in another place.
- The flow of water in a stream is affected by barriers in its path caused by erosion and deposition.
- Steeper slopes results in faster-flowing water, which has more energy and can carry larger loads of material, increasing the amount of erosion and deposition.
- During a flood, the streams’ velocity increases dramatically, increasing erosion and deposition.
- A topographic map uses contour lines to show the shapes and elevation of the land.
- The change in elevation between two adjacent contour lines is always uniform.
- The closer the contour lines, the steeper the slope and vice versa.
- A profile is a side view or cross-section of a landform.
- A profile can be drawn from information given on a topographic map.

Students will be able to:

- Create a model of the school playground.
- Transfer the model onto a plastic grid.
- Transfer the plastic grid onto a map and create a key.
- Identify advantages and disadvantages of a map and a model.
- Set up stream tables and run water through them.
- Observe the process of erosion and deposition.
- Set up a sloped stream table and observe the effects on erosion and deposition.
- Set up a flood stream table and observe the effects on erosion and deposition.
- Build a model mountain out of foam and trace outlines of each layer to create a topographic map.
- Use the topographic maps to produce two-dimensional profiles.
- Interpret a topographic map.
- Read and interpret a USGS topographic map.
- Compare their foam mountains to the USGS topographic map.
- Challenge each other to locate mystery locations on the USGS topographic map.
- View and compare aerial photographs to topographic maps of two different regions in the United States.

▪ Most topographic maps use the same types of symbols to represent landforms and other human-made and natural features. ▪ Photographs and topographic maps are two way to represent a real place. ▪ Maps can be drawn from aerial photographs.	
Name:	**Dates: Rotating Basis**
Course/Subject: Science, Grade 6	**Unit Plan: Food and Nutrition**
Stage 1 – Desired Results	
PA Standard(s)/Assessment Anchors Addressed: **S8.A.2.1** **Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.** **Eligible Content:** **S8.A.2.1.2** **Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.** **S8.A.2.1.5** **Use evidence from investigations to clearly communicate and support conclusions.** **S8.A.2.2** **Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.** **Eligible Content:** **S8.A.2.2.1** **Describe the appropriate use of instruments and scales to accurately and safely measure time, mass, distance, volume, or temperature under a variety of conditions.** **S8.A.2.2.2** **Apply appropriate measurement systems (e.g., time, mass, distance, volume, temperature) to record and interpret observations under varying conditions.**	
Understanding(s): ***Students will understand . . .*** 1. Foods can contain different kinds of the nutrient, fat. 2. Sugar is a simple carbohydrate and some foods contain more sugar than others. 3. The sour taste in food is acid and foods can contain different amounts and kinds of acids, such as vitamin C. 4. Calorie count can be determined from the fats, carbohydrates, and proteins found in food.	**Essential Question(s):** ▪ How can we tell how much fat is in a particular food? ▪ What does the size of a grease spot tell us about the amount of fat in the food? ▪ How can we test foods to determine how much sugar they contain? ▪ Which breakfast cereals contain the most sugar? ▪ Which foods contain sugar and how can we determine the relative amount? ▪ How can baking soda be used as an indicator of acid? ▪ Which citrus fruit contains the most acid? ▪ Which fruit drinks have the highest concentration of vitamin C? ▪ What does a nutritional lunch consist of?

Learning Objectives: ***Students will know . . .***	***Students will be able to:***
▪ Relative amounts of fat can be determined by controlling variables in the fat test. ▪ Foods can contain two kinds of fats, saturated or unsaturated. ▪ Sugar is a simple carbohydrate, which is a nutrient found in food. ▪ Yeast can be used to indicate sugar in foods. ▪ Yeast needs sugar to become active. ▪ A product of yeast is carbon dioxide, the same gas produced by most organisms. ▪ Some foods contain more sugar than others do. ▪ The more carbon dioxide produced by yeast in a food sample, the more sugar in the sample. ▪ Baking soda and acid react chemically to form new products. ▪ Baking soda can be used to indicate acid. ▪ When baking soda is present in excess, the volume of carbon dioxide produced when soda reacts with an acid is proportional to the concentration of the acid. ▪ The sour taste in foods is due to acids. ▪ Indophenols can be used to indicate vitamin C (ascorbic acid). ▪ Vitamins are nutrients that help the body function properly. ▪ Calories are a measure of the amount of energy in foods. ▪ Labels on food packages provide nutritional information on carbohydrates, proteins, fats, vitamins, and calories. ▪ Fats have more than twice as many calories as carbohydrates or proteins.	▪ Conduct a fat test using brown paper as an indicator. ▪ Compare the relative size of the grease spots to estimate the percentage of fat in each food. ▪ Measure the volume of carbon dioxide produced. ▪ Test cereals for sugar and rank them by their content. ▪ Measure the volume of gas produced by the acid/baking soda reaction. ▪ Find relationships between the acid concentration of fruits and their tastes. ▪ Test a number of drinks to see how much vitamin C they contain using indophenols. ▪ Assemble hypothetical lunches, analyze them, and assess the nutritional value and total number of calories.