

All Mixed Up

Strand	Matter
Topic	Investigating mixtures and solutions
Primary SOL	5.4 The student will investigate and understand that matter is anything that has mass and takes up space; and occurs as a solid, liquid, or gas. Key concepts include e) mixtures including solutions.
Related SOL	5.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which g) data are collected, recorded, analyzed, and communicate using proper graphical representations and metric measurements; h) predictions are made using patterns from data collected, and simple graphical data are generated. 5.4 The student will investigate and understand that matter is anything that has mass and takes up space; and occurs as a solid, liquid, or gas. Key concepts include b) the effect of temperature on the phases of matter; c) atoms and elements; d) molecules and compounds.

Background Information

A *mixture* is a combination of at least two or more different substances that do not lose their identifying characteristics when combined, such as soil and water or milk and cereal. Many mixtures can be separated by simple physical means. When two substances mixed together cannot be easily separated because one substance dissolves in the others, the mixture is a *solution*. It is possible to separate the two substances, but not very easily. An example of a solution is sugar dissolved in water: the sugar is still there, but it is dissolved, and in order to separate it out, the liquid would need to evaporate. Students also need to understand that all solutions are mixtures, but not all mixtures are solutions. Students will also need to be able to write a conclusion based on observations.

Materials

- Clear plastic cups
- Powdered drink mix
- Water
- Pepper
- Mixed fruit salad
- Marbles
- Sand
- Yogurt with fruit mixed in

- Milk
- Chocolate powder
- Salt
- Copies of attached worksheets “Comparing and Contrasting Mixtures and Solutions” and Venn diagram
- Overhead projector or Interactive Whiteboard (optional)

Vocabulary

mixture, solution

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Setup and Introduction

1. Use the attached worksheet to prepare the designated mixtures and solutions, or adapt this worksheet to use with other mixtures and solutions.
2. Place the prepared cups at different locations, or centers, around the classroom. Be sure to label each cup clearly with the substance from the cup to match the worksheet, such as “Mixed fruit salad.”
3. Facilitate student brainstorming to come up with class definitions of *mixture* and *solution* to write on the board for reference during the center rotations.

Procedure

1. Have students work individually or in pairs to complete the worksheet “Comparing and Contrasting Mixtures and Solutions” as they rotate from center to center in the classroom. Remind students that it may be possible to check both the mixture and solution box, but that they need to explain why they chose both.
2. When all solutions at each center have been evaluated and the worksheet is completed, students are to write down their conclusions individually.
3. Lead the class in a discussion about their results when substances are mixtures or when they are solutions, the reasoning behind them, the characteristics of each type of substance, and the conclusions. As the class discusses their results, lead the students to explain the similarities and differences between mixtures and solutions. Be sure they grasp the concept that all solutions are mixtures, but not all mixtures are solutions.

Conclusion

1. After the discussion, hand out the attached Venn diagram to each student.
2. Have each student individually fill out the areas of the diagram, listing the various mixtures and solutions they have identified as well as the characteristics identified in the discussion.
3. Place a copy of the diagram on the overhead projector or Interactive Whiteboard, or make a large version on the board, and have the students complete the class Venn diagram together.

Assessment

- **Questions**
 - What substances were you surprised to find were mixtures or solutions? Why?
 - What is the difference between a mixture and a solution? Explain.
 - How can a scientist determine if a new substance is a mixture or a substance?
- **Journal/Writing prompts**
 - Write a poem or a song showing the differences between mixtures and solutions.
 - Compare and contrast a solution and a mixture.
- **Other**
 - Use the completed worksheets for immediate assessment.
 - Give students different mixtures and solutions to identify, using the same kind of data sheet to evaluate the reasoning behind their answers.

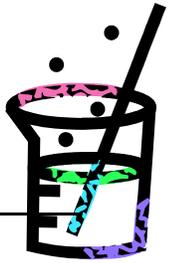
Extensions and Connections (for all students)

- Have students keep track of all of the mixtures and solutions that they encounter over one day.
- Take this a step further by investigating suspensions (e.g., vegetable oil and water) or dilatants (e.g., Ooblek: two parts cornstarch to one part water) to have students observe and assess whether the substances are mixtures or solutions.
- Invite a chef or a cement truck driver to the class to discuss mixtures and solutions in their jobs.

Strategies for Differentiation

- Students who struggle with differences between solutions and mixtures may need to have a written or drawn representation beside a cup at each center.
- Provide students with picture cards of mixtures and solutions. Direct them to move to one side of the room if they have a mixture and the opposite side of the room if they have a solution. Shuffle the cards and repeat.
- Have students work in groups to make lunch items that are examples of mixtures and solutions (menu items could include iced tea, vegetable soup, and fruit salad).

Comparing and Contrasting Mixtures and Solutions



Names: _____ Date: _____

Closely observe the contents of each cup, and decide whether the substance is a **mixture** and/or a **solution**. Put a check in the correct columns. Explain the reason for your decision under the “Reason” heading.

Substances	Mixture (✓)	Solution (✓)	Reason
Powdered drink & water			
Water & pepper			
Mixed fruit salad			
Marbles & sand			
Sand & water			
Fruit & yogurt			
Chocolate powder & milk			
Water & salt			

Form a conclusion based on your observations, and write your conclusion below:

Comparing Mixtures and Solutions in a Venn Diagram

Name: _____ Date: _____

