

Teaching to Standards: Science

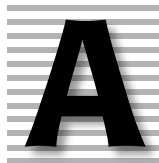
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Lesson **2** Chemical reactions

Concept

Some mixtures have a chemical reaction.

Background

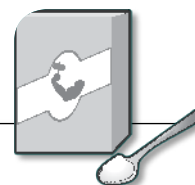
In this lesson, students learn more about mixtures. They learn that mixing different materials together can produce a chemical reaction. The lesson begins with an explanation of what a chemical reaction looks like. For safety, this lesson uses vinegar, baking soda, salt, and flour for the experiment. Treat the mixtures as you would dangerous chemicals to teach students to be cautious with all chemicals and materials.

Materials

- 3 clear plastic cups and 1 plastic spoon for each student and for demonstration
- Picture and word cards for solute, solvent, solution, chemical reaction
- KWHL chart
- Safety Rules for Science Class poster
- Student Response Guide, pages 189–199
- ScienceWork, pages 67–69 and 102–103



Small bag of flour, container of salt, baking soda, gallon of vinegar, permanent marker, 3 large zip-tight plastic bags



Preparation

Partially fill 3 zip-tight plastic bags with the solid materials and set them next to the packages (e.g., place the plastic bag with salt next to the container of salt) in your work area. Using a permanent marker, write S, B, or F on the cups so each student will have a set of each.

Vocabulary

Review picture and sight word cards for this unit (see pages 189–191).

Engage

STEP 1		
Materials	Procedure	Follow-up
<ul style="list-style-type: none">• Bags of flour, salt, baking soda• ScienceWork, pages 102–103: What is a chemical reaction?	<p>Engage the students by telling them: Today in science we're going to see that when we mix some solutes with solvents, the mixtures could have a chemical reaction. Before we begin our experiment, let's talk about what a chemical reaction is. What will it look like?</p> <p>Read pages 102–103 in ScienceWork and have the students follow along. Point out that when a chemical reaction happens, they'll be able to see a change, and sometimes they'll be able to hear the change (as in bubbling).</p>	
	<p>Let's begin our experiment. Here are some of our materials.</p> <p>Open the bags so students are able to see the consistency of the materials. Show the bags to the students and invite them to examine the materials for a few moments, make comments, and ask questions.</p>	<p>If students ask, "What are these?" say: Good question.</p>

Engage



STEP 2

Materials	Procedure	Follow-up
<ul style="list-style-type: none"> ● Bags of flour, salt, baking soda ● Vinegar ● Picture and word cards for solute and solvent ● Student Response Guide, page 189: What is this? 	<p>Hold up each bag one at a time and ask: What do you think is in this bag? Make a guess. Give each student a chance to guess before giving feedback. Remember, you do want students to make guesses in an inquiry lesson.</p> <p>Have each student respond orally with “salt,” “flour,” or “baking soda”; use an AAC device to respond; or point to responses on the Student Response Guide page.</p> <p>Prompt students who don’t have symbol use to look at the contents of the bags and to touch the pictures in the Student Response Guide. For example, say: You’re looking at salt. This is salt.</p> <p>Review the concept of solute. While holding the bags, say: This is flour. This is salt. This is baking soda. They are solids and are the solutes for our experiment today.</p> <p>Then hold up the picture and word cards for solute and say: This is the picture for solute, and this is the word solute. Say solute.</p> <p>Hold up the vinegar and introduce it as a solvent. Say: I have one more material to show you. This is vinegar. Vinegar is a liquid, and it is the solvent for our experiment today.</p> <p>Then hold up the picture and cards for solvent and say: This is the picture for solvent, and this word says solvent. Say “solvent.”</p>	<p>Praise correct responses. If students give an incorrect answer, say: That’s a good guess. Then give a brief reason why the choice is not the best response. For example, for “sand,” say: That’s a good guess. It looks a bit like sand, but it’s actually flour.</p>

Engage

STEP 3		
Materials	Procedure	Follow-up
<ul style="list-style-type: none"> ● Bags of flour, salt, baking soda ● Vinegar ● KWHL chart ● Student Response Page Guide, page 190: What do you know? 	<p>Point to the flour and ask: What do you know about what's in this bag?</p> <p>Have the students tell something they know about the flour. Have each student respond orally, use an AAC device to respond, or point to responses on the Student Response Guide page.</p> <p>Prompt students who don't have symbol use to look at the contents of the bag and to touch the picture of "It's dry" in the Student Response Guide. For example, say: You're looking at flour. Flour is dry.</p> <p>Repeat the question for the baking soda, then the salt, and then the vinegar.</p>	<p>Praise correct responses.</p> <p>Correct inappropriate answers by giving a brief reason why the response isn't the best response. For example, if "It's loud" is chosen, say: I don't think it makes a sound. Do you hear it?</p> <p>On the KWHL chart, record the correct answers in the "Know (K)" column. Draw a line to separate the responses for each: the flour, the baking soda, the salt, and the vinegar.</p>
STEP 4		
Materials	Procedure	Follow-up
<ul style="list-style-type: none"> ● Bags of flour, salt, baking soda ● KWHL chart ● Student Response Guide, page 191: What do you want to know? 	<p>Point to the materials and ask: What do you want to know about the liquid and these solids?</p> <p>Have students tell anything they might want to know about the materials.</p> <p>Have students respond orally, use their AAC devices to respond, or point to responses on the Student Response Guide page.</p> <p>Prompt students who don't have symbol use to choose any picture response. Provide feedback to students to help build meaning.</p>	<p>Acknowledge any response. For example, if "What colors are they?" is chosen, say: It's easy to tell what color they are.</p> <p>Guide students to the answer: "What will happen if we mix them together?" Say: I would like to know what will happen if we mix them together. How about you?</p> <p>On the KWHL chart, record this response in the "Want (W)" column.</p>



Investigate and describe relationships

STEP 5

Materials	Procedure	Follow-up
<ul style="list-style-type: none">● KWHL chart● Student Response Guide, page 192: How can we find out?	<p>While pointing to the “W” column on the KWHL chart, restate: We want to know what happens if we mix them together. Then ask: How can we find out?</p> <p>Have each student respond orally, use an AAC device to respond, point to a response on the Student Response Guide page, or pantomime a stirring action.</p>	<p>If students give alternate correct answers or incorrect answers, give a brief demo or explanation. For example, if they answer “Look at them,” let them look at the bags and say: That didn’t give us much information. What else could we do?</p> <p>After several students respond, acknowledge the one who answers, “Mix them,” or point to the preferred response and say: I think the easiest way to find out is to mix them.</p> <p>On the KWHL chart, record responses in the “How (H)” column. Circle “Mix them.”</p>



Investigate and describe relationships

STEP 6

Materials	Procedure	Follow-up
<ul style="list-style-type: none">● 3 marked cups and 1 spoon per student● Vinegar● Bag of flour, container of salt, box of baking soda● Picture and word cards for chemical reaction● Safety Rules for Science Class poster● Student Response Guide, page 193: What do you think will happen?	<p>Review the safety rules for science listed on the poster.</p> <p>Distribute a set of the 3 marked cups and a spoon to each student. Fill each cup $\frac{1}{3}$ full of vinegar. Say: We're going to put vinegar into each of the cups and see what happens when we mix different materials—different solutes—with the vinegar. When materials are mixed together and make a big change, that change is called a chemical reaction. We'll find out if the different materials will have a chemical reaction with the vinegar. Then hold up the picture and word cards for chemical reaction and say: This is the picture for chemical reaction, and these words say chemical reaction. Say "chemical reaction."</p> <p>Line up your own set of cups of vinegar and place one solid in front of each cup to show students what will be mixed with the vinegar.</p> <p>Do you think the solutes will have the same reaction when we mix them with the solvent—yes or no?</p>	
	<p>Have each student make a prediction by responding orally, using an AAC device to respond, pointing to a response on the Student Response Guide page, or nodding.</p>	<p>Tally the students' answers—how many said yes and how many said no—and record them in the open area at the bottom of the KWHL chart to refer to at the end of the lesson.</p>



Investigate and describe relationships

STEP 7

Materials	Procedure	Follow-up
<ul style="list-style-type: none">3 cups with vinegar and 1 spoon per studentBags of salt, flour, baking soda	<p>Say: You each just made a prediction. Some of you said yes, the materials will all have the same reaction when they're mixed with the vinegar, and some of you said no. Let's find out.</p> <p>Provide salt for each student. Instruct each student to put some salt in the cup marked S (or you can add this to the cup for the student). Then have the student stir it and observe the (lack of) reaction.</p> <p>Repeat for the flour, having the student place the flour in the cup marked F, stir the mixture, and observe the (lack of) reaction.</p> <p>Finally, repeat for the baking soda, having the student place the baking soda in the cup marked B, stir the mixture, and observe the reaction.</p>	<p>Describe aloud what happens and encourage the students to tell what they see (e.g., "Nothing is happening" or "It's bubbling"). Be sure students with visual impairments actively participate in the experiment (e.g., by stirring the mixture or by hearing you describe what's happening).</p> <p>When placing the baking soda in the vinegar solvent, say: Do you notice the bubbles? The vinegar and the baking soda just had a chemical reaction.</p>

STEP 8

Materials	Procedure	Follow-up
<ul style="list-style-type: none">The cups with the mixturesStudent Response Guide, page 194: What's the same?	<p>Hold up the cups, one at a time and say: Here's one of the mixtures from the experiment—the vinegar and the salt. Here's another mixture from the experiment—the vinegar and the flour. Here's another mixture from the experiment—the vinegar and the baking soda. What's the same about these mixtures?</p> <p>Have each student respond orally, use an AAC device to respond, or point to a response on the Student Response Guide page to say they are all mixtures and they are all liquids.</p> <p>Prompt students who don't have symbol use to look at or touch the cups with the 3 mixtures after another student correctly identifies that the materials are mixtures.</p>	<p>Praise correct responses: Yes they are all liquids and mixtures. That makes them the same.</p> <p>If the students are not making a choice or are making an incorrect choice, hold up one cup at a time and say: What's in this cup? Remember we added vinegar to all the cups. Then we added something else to each one. (Point to the materials that were added.) We mixed the materials into the vinegar to make these mixtures. These are all mixtures. That makes them the same. And they are all liquids (jiggle the cup to show the mixtures are liquid).</p>



Investigate and describe relationships

STEP 9

Materials	Procedure	Follow-up
<ul style="list-style-type: none">• The cups with the mixtures• Student Response Guide, page 195: What's different?	<p>Hold up the cups one at a time and say: Look again. Here's one of the mixtures from the experiment—the vinegar and the salt. Here's another one—the vinegar and the flour. Here's another one—the vinegar and the baking soda. What's different about the mixtures?</p> <p>Have each student respond orally, use an AAC device to respond, or point to a response on the Student Response Guide page to say one had a bubbly reaction.</p> <p>Prompt students who don't have symbol use to look at or touch the mixture with the bubbles and then touch one without bubbles.</p>	<p>Praise correct responses: Yes, one had a bubbly reaction and the others didn't. That makes this one different.</p> <p>If the students are not making a choice or making an incorrect choice, hold up one cup at a time and say: Let's look at all the cups. When we added the flour to the vinegar, we didn't see a reaction. When we added the salt, we didn't see a reaction. When we added the baking soda, we did see a chemical reaction. Only the baking soda and vinegar made a chemical reaction by bubbling. The bubbly reaction was different for this mixture.</p>



Construct explanation

STEP 10

Materials	Procedure	Follow-up
<ul style="list-style-type: none">• The cups with the mixtures• Picture and word cards for chemical reaction• Student Response Guide, page 196: What scientific discovery did we make?	<p>Read the scientific discovery statement once: Some mixtures have a chemical reaction.</p> <p>Say: Let’s review what we did. First we poured the liquid vinegar into the cups. Then we added some solutes—the flour to this cup, the salt to this cup, and the baking soda to this cup. We mixed the solutes with the vinegar and made different mixtures. And we watched to see if any of the mixtures had a chemical reaction. Put the picture and word cards for chemical reaction in front of the mixture that had a chemical reaction.</p>	
	<p>Give students a turn to do the same (i.e., put the picture and word cards in front of their mixture that had a chemical reaction).</p> <p>For students who don’t respond, have them put the picture card with the materials and then guide them to match the word card. Other students may be prompted to look at the mixture while you or a peer places the picture and word cards.</p> <p>Read the scientific discovery statement again, pointing to the words on the Student Response Guide page as you read and having the students follow along.</p>	<p>Give praise: Yes, this is the mixture that had a chemical reaction. Say “chemical reaction.”</p>



Report

STEP 11

Materials	Procedure	Follow-up
<ul style="list-style-type: none">● Picture and word cards for chemical reaction● KWHL chart● Student Response Guide, pages 197–198: What did we find out? and Why?	<p>Say: Let’s review what we found out. I asked you if you thought the solutes would have the same reaction when we mixed them with the vinegar solvent.</p> <p>Point to the predictions on the KWHL chart. Some of you said yes, and some said no. Did all the solutes have a chemical reaction when we mixed them with the solvent?</p> <p>Have each student respond orally, use an AAC device to respond, or point to a response on the Student Response Guide page, or nod yes or no.</p>	<p>Praise the students and then summarize: No, the mixtures didn’t all react the same way. One of the mixtures bubbled, and the others did not.</p> <p>If any students respond yes, show the mixtures and add a little more baking soda to the cup marked B.</p> <p>Write “Yes—change” in the open area at the bottom of the KWHL chart.</p>
	<p>Point to the mixture marked B and ask: Why did the mixture in one cup bubble?</p> <p>Have each student respond orally, use an AAC device to respond, or point to a response on the Student Response Guide page to indicate that the mixture bubbled because there was a chemical reaction.</p> <p>Ask students to point to the picture and word cards for chemical reaction, then say “chemical reaction.”</p>	<p>Point to the B mixture and say: Yes, this mixture bubbled because there was a chemical reaction.</p> <p>Scaffold for those who don’t respond by asking: Which mixture bubbled? Or point to the cup marked B and say: This mixture had a chemical reaction.</p>



Report

STEP 12

Materials	Procedure	Follow-up
<ul style="list-style-type: none">● KWHL chart● Student Response Guide, page 199: What did we learn?	<p>Say: Let's review what we learned. What can happen when you mix materials? Some mixtures have a _____.</p> <p>Have each student respond orally with "chemical reaction," use an AAC device to respond, or point to a response on the Student Response Guide page to fill in the blank.</p>	<p>Say: Yes, some mixtures have a chemical reaction. We put different solutes in each cup, and one had a chemical reaction.</p> <p>Scaffold for students who say "laugh" or "pizza" by rephrasing the question: What did we say happened when the materials bubbled?</p> <p>Write "Some mixtures have a chemical reaction" in the "Learned (L)" column of the KWHL chart.</p>

Review vocabulary

Materials: Picture and word cards for solute, solvent, solution, chemical reaction

Procedure: Use the time-delay procedure to review each of the vocabulary words for the unit. See page 8 for the procedure.



Extend and review lesson

Read the story on page 67 in **ScienceWork** with the students. Help them apply the scientific concept they learned in this lesson to the story. Complete the exercise following the story together or send it home as homework.