5th Grade Science: Mixtures & Solutions

Science Concepts addressed in this lesson: 5th grade - Mixtures and Solutions
A mixture combines two or more materials that retain their own properties. A solution forms when a material dissolves in a liquid (solvent) and cannot be retrieved with a filter.

Science Learning Objectives:

(1) Students will be able to explain that mixtures are a combination of two or more materials that retain their own properties. They will also be able to identify mixtures.
(2) Students will be able to explain that a solution occurs when something is dissolved in a solvent and the two cannot be separated with a filter. They will also be able to identify solutions.

Colorado Academic Standards (CAS): 5th Grade Standard 1: Physical Science
Concepts and skills students master: 1. Mixtures of matter can be separated regardless of how they were created; all weight and mass of the mixture are the same as the sum of weight and mass of its parts

Materials List Per Group:
18 students – 6 groups of 3

- **6 clear plastic cups, labeled "P", "G", and "S"**
- **1 screen***
- **1 FOSS Funnel***
- **1 popsicle stick***
- **2 paper filters***
- **2 paper towels**
- **1 syringe***
- **1 water container, ½-liter**
- **5-mL gravel***
- **5-mL diatomaceous earth (referred to as "Powder")***
- **5-mL kosher salt***

Other:

- **Lunch box with trail mix, chicken noodle soup, fruit salad, and kool-aid mix.**
- **Science lab notebooks (students keep these in their desks)**
- **Exit tickets**
- **Student lab worksheets entitled "Separating Mixtures", provided by teacher***

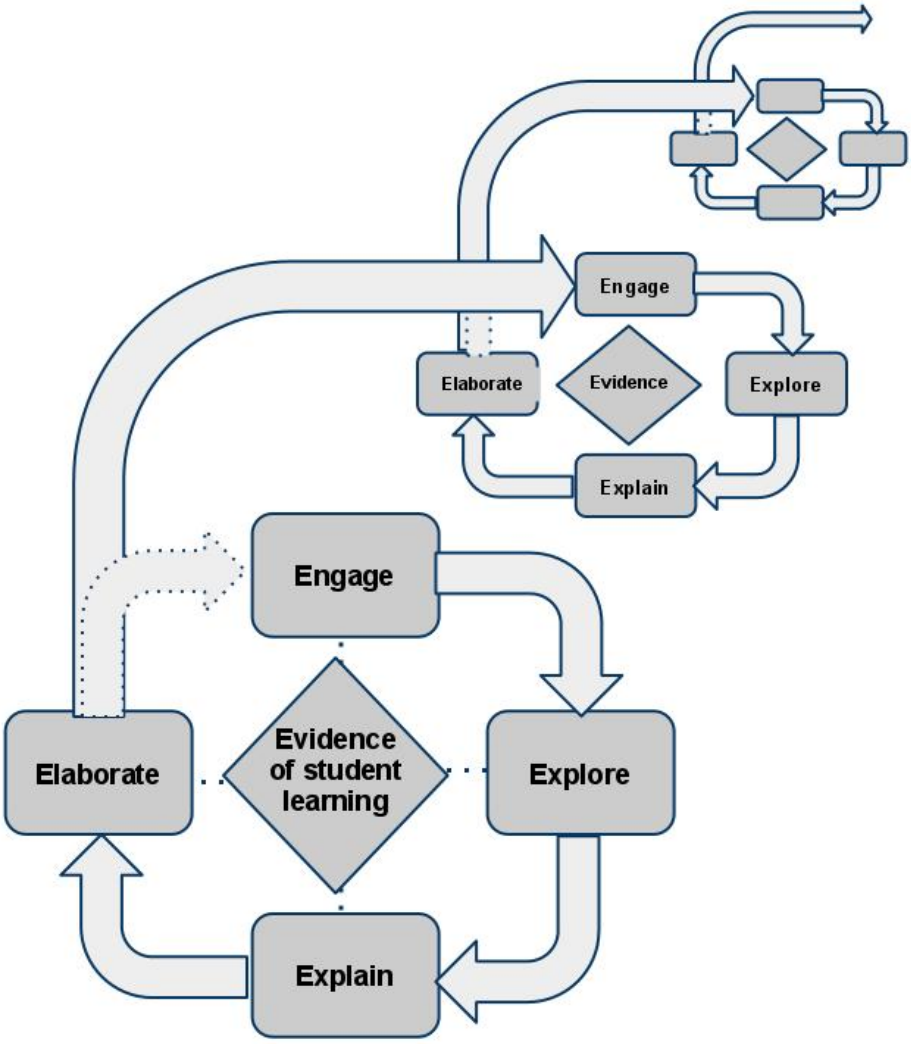
**** indicates that this item was supplied by the FOSS kit.***

Ways to Support Learners with Special Needs (English Learners, Special Ed, etc.):

To make sure that all students are able to stay focused and have an understanding of their learning expectations, the teacher will clearly explain the directions and learning goals for this lesson and keep the

instructions displayed on the white board throughout the lesson. The teacher will increase understanding of the procedure by modeling the gravel mixture and filtering in front of the class. Because there are a lot of materials and steps involved, the groups will be pre-selected by the teacher and each student will know their specific duty within their group of 3.

The Inquiry Learning Cycle



ENGAGEMENT Section:

Motivate the lesson by drawing on what the students experience in their lives, assessing students' prior knowledge from an earlier lesson, and intriguing students in what's to come in your Exploration.

# of Minutes ____8_____

Detailed Steps **Describing What the** ***Teacher*** **Will Do in This Portion of the Lesson**	**Questions the Teacher Will Ask** ***to Elicit Students' Scientific Reasoning*** ****Include possible student responses****	**Description of What the Students are Doing in This Portion of the Lesson**
1. Ask students what they know about mixtures and solutions.	What do you know about mixtures and solutions?	Students will raise their hands and answer questions when they are called on.
2. Show students the contents of my lunchbox (trail mix, a chocolate-chip cookie, fruit salad, juice box). Ask students which items they would categorize as mixtures and which items they would categorize as solutions (if any).	Do you think any of the things I packed in my lunchbox are mixtures?	Students will participate in group discussion.
3. If they do not already say it during discussion, tell students that mixtures are created any time two or more substances with different properties are combined and can be separated manually (i.e. through sorting, filtering, etc.).	What if I told you that a mixture is created anytime two or more different substances or items are combined? Now do you think any of my lunch items would be considered a mixture? Why or why not?	Students will participate in quiet group discussion.
4. Based on their knowledge of mixtures and solutions, ask students how they might investigate whether certain items are considered mixtures or solutions. Tell students that today, we will be creating mixtures and solutions using supplies in their lab kits. Ask students to think about	What do you think of when you give an example of a mixture? What do you think of when you give an example of a solution? Why? These are all great examples! Today we are all going to be	

ways that we can test whether something is a mixture or a solution.	scientists and we are going to perform some experiments to find out more about mixtures and solutions. During the experiments, your goal is to identify some combinations of items as mixtures or solutions. Who remembers the difference between a mixture and a solution? Ok so then how do you guys think we can test whether something is a mixture or a solution? [Assuming a student suggests separating different combinations, move on to the instructions. If not, explain that we can test by trying to separate the combinations using the supplies in their lab kits.] Today, we are going to create mixtures and solutions by combining the gravel, powder, and salt in your lab kits with water. I'm not going to tell you which combinations are mixtures and which ones are solutions. After you combine the solids and liquids, it's your job to decide which ones are mixtures and which ones are solutions by trying to separate them using various methods.	

Decision Point

What you'll do to get evidence students are ready to move to the next section	What is the evidence from students that will help you make the decision to move forward or not
Ask students to think of ways to test whether something is a mixture or a solution.	Ask the class if they have any questions or ideas to share about mixtures and solutions before we begin the experiments. If there are no additional questions/comments then we are ready to move on.

EXPLORATION Section:

Investigate the science concepts of the lesson. Have students conduct an experiment. They should make observations and gather evidence. Provide enough detail of the procedure so it is clear how this Exploration will happen (e.g., how students are gathering & setting up materials, collecting & recording data, etc.).

*****Remember your lesson objectives*****

# of Minutes ___35_____

Detailed Steps Describing What the Teacher Will Do in This Portion of the Lesson	***Questions the Teacher Will Ask to Elicit Students' Scientific Reasoning*** ****Include possible student responses****	**Description of What the Students are Doing in This Portion of the Lesson**
1. Pass out pre-assigned group duties on pieces of paper. Review safety rules and duties of each group member. Have 1 member per table gather their tray of materials from the back of the classroom. Have a helper pass out the FOSS lab worksheets.	Students will listen to safety rules and gather materials.	Students will listen to safety rules and gather materials.
2. Display instructions on a PowerPoint slide on the Smartboard. Tell the class that they are not allowed to begin the experiment until they are told to do so.	Explain that each group member has a specific job. The "Gravel Genius" will go first, followed by the "Powder Pro", and lastly the "Salt Specialist". Each member will begin by measuring 50mL of water using the syringe. The student will use the syringe to extract water from the pre-filled water container in their lab kit. Next, they will take their designated material cup (labeled "G", "P", or "S"), and carefully squirt the water into the cup. Next, they will use the popsicle stick to stir the contents of the cup. After the water and solid are evenly dispersed, the group member will pour the contents of the cup through a screen and into	2. Students will listen quietly as teacher explains instructions.

	an empty plastic cup. If the solid separates from the water using the screen, there is no further testing required for that material. If the solid does not separate, then they must use the filter and funnel to try and separate the two. While the designated group member is taking their turn creating and separating the mixtures, the other two group members will record their observations on the student lab worksheet.	
3. Following the “I Do, We do, You do” gradual release method, model the procedure of creating the gravel and water combination. Stir the water and gravel together in the cup and walk around the room so that students can see the combination.		Students will listen quietly and watch while teacher models the procedure.
4. Teacher will instruct students to proceed with creating the gravel mixture. Tell students to write their observations down in the observation section of their lab worksheets. Display a copy of the worksheet using the document camera so that they can see which section to fill in.	Teachers will circulate the room and watch while students pour water into cup containing solid material.	Students will follow the instructions for the experiment and perform the necessary steps when instructed to do so. Students will record their observations on their lab worksheets.
5. Once students have written their observations, remind them that we are testing for mixtures or solutions by separating the combinations we create. Ask them to have a small group discussion and make a prediction about the gravel and water combination.	Ask students to have a 1-minute small group discussion about whether or not they will be able to separate the water from the gravel.	Students will participate in short group discussion and make predictions after they have recorded their observations.

6. “We do”: Model how to separate the gravel from the water using the screen. When ready, tell students to proceed with separating the water and gravel.	Ask students to watch as I show them where to place the screen in order to separate the water and gravel. Next, instruct students to pour the water over the screen.	Students will watch as teacher shows how to use the screen to separate the contents, then they will perform the test on their own.
7. After separating the water and gravel using the screen, ask students to have a small-group discussion about whether they think each combination is a mixture or a solution. Display lab worksheet using the doc cam and instruct students to fill in the necessary observations and conclusions in the designated sections on their lab worksheet.	Ask students to have a small-group discussion about whether they think the combination is a mixture or a solution. Ask “If we were able to separate the two using the screen, do you think we have an answer to our question or do we need to test using the filter to find out if it’s a mixture or a solution?”.	Students will fill out a table on their lab worksheet and indicate whether or not each mixture could be separated using the screen and/or the filter paper.
8. Instruct the group leader (Gravel Genius, Powder Pro or Salt Specialist) to put cups and materials back in lab kit once they are finished with each test.		Group leader will put designated test materials back in lab kit when they are finished with each individual test.
9. Ask groups to give a thumbs up once everyone has recorded their data on the worksheet and put materials back in lab kit. Once all thumbs are up, instruct students to begin their next experiment and display instruction slide on the Smartboard.		
10. You do: Repeat steps 4-9 for		

powder test and then salt test. During each experiment, teacher(s) will circulate the room while students conduct their experiments and answer any questions/make sure groups stay on task.		
10. Encourage group discussion about their findings, ask students to empty any liquids and put lab materials back in their lab trays.	Which combinations could you separate using the screen? Which combinations could you separate using the filter paper? Why is it important to use the filter paper if the screen did not work?	

Decision Point

What you'll do to get evidence students are ready to move to the next section	**What is the evidence from students that will help you make the decision to move forward or not**
Observe group experiments and make sure students have recorded their observations.	Students will answer questions and participate in group discussion using the data that they collected from their experiments.

EXPLANATION Section:

Involve as many <u>students</u> as possible in explaining their thinking about what occurred during the above investigation. This is not the time for the teacher to explain. Instead the teacher should ask questions to help the students analyze their evidence and make inferences from the data. Listen to their analysis and help them connect their ideas together.
*****Remember your lesson objectives*****

# of Minutes _____5____

<u>Detailed Steps</u> Describing What the <u>Teacher</u> Will Do in This Portion of the Lesson	***Questions the Teacher Will Ask <u>to Elicit Students' Scientific Reasoning</u>*** ****Include possible student responses**** *Ask Students "Why do you think that?" and "How do you know?" and "What data do you have for that claim you're making?" as much as you can!*	**Description of What the <u>Students</u> are Doing in This Portion of the Lesson**
During this section, the teacher will ask students questions about their investigation.	What did you notice about the different experiments? What was surprising to you? Why? Based on your observations, which combinations are mixtures? Why? Which combinations are solutions? Why? What data do you have that helped you make that decision? Why do you think the salt and water combination did not separate using the screen or filter?	Students will participate in group discussions and answer questions when they are called on by the teacher.
Explain to the class that the salt and water combination is a	What does it mean for a substance to dissolve?	

solution because the salt dissolved into the water.	What are some other substances that you think will dissolve in water? Why/how do you know?	

Decision Point

What you'll do to get evidence students are ready to move to the next section	What is the evidence from students that will help you make the decision to move forward or not
Continue to ask further questions in order to guide student learning and understanding	Students will correctly identify the gravel and powder combinations as mixtures. Students will correctly identify the salt and water combination as a solution. Students will discuss the concept of a substance dissolving in water.

ELABORATION Section:

Help the students apply the scientific findings from the Exploration and Explanation to a different situation (e.g., a previous/future lesson concept or a everyday phenomena). Help the students determine what they might do next or what new questions they have. *Suggestion: Connect back to your Engagement section by revisiting their initial predictions.*

Please think about

- Remediation: If students do not understand the material, re-teach using a different method (think beyond lecture)
- Enrichment: If students master the materials very fast, then think of additional activities to do

# of Minutes ____5_____

Detailed Steps Describing What the Teacher Will Do in This Portion of the Lesson	***Questions the Teacher Will Ask to Elicit Students' Scientific Reasoning*** ****Include possible student responses****	**Description of What the Students are Doing in This Portion of the Lesson**
Teacher will continue to ask questions	What did you learn about creating mixtures and solutions today? What did you learn about separating mixtures and solutions today? Why do you think we used screens and filters to try and find out which combinations are mixtures and which ones are solutions? How do you think you could separate the salt and the water? What are some examples of mixtures that you use/see/create/consume in your every day life? What are some examples of solutions that you	Students will participate in group discussions and answer questions when they are called on by the teacher.

	use/see/create/consume in your everyday life?	

Decision Point

What you'll do to get evidence students are ready to move to the next section	What is the evidence from students that will help you make the decision to move forward or not
Ask students questions about the reasoning behind our experiments. Ask students about mixtures and solutions in everyday life.	Students will show their understanding by accurately describing the reasons why we performed the procedures the way that we did. Students will give informed examples of mixtures and solutions in everyday life.

EVIDENCE of Student Learning Section:

Assess how well <u>each</u> student understood the scientific concepts of this lesson so you can determine how to approach your next lesson. <u>How well did each student meet your lesson objectives you wrote at the top of your lesson plan?</u>

# of Minutes _____5____

<u>Detailed Steps</u> Describing What the <u>Teacher</u> Will Do in This Portion of the Lesson	***Questions the Teacher Will Ask <u>to Elicit Students' Scientific Reasoning</u>*** ****Include possible student responses****	**Description of What the <u>Students</u> are Doing in This Portion of the Lesson**
Teacher will conclude the lesson by asking students to take out a sheet of paper and fill out an "Exit Ticket".	On a sheet of paper, students will answer the following questions: 1. Based on your observations and the data you collected, what makes a mixture different from a solution? 2. Give one example of a mixture and one example of a solution. You can use a Venn Diagram or make a list to help guide your thoughts.	Students will write their answer and explanation on an exit ticket to be turned in at the end of the lesson.