

JEdSTEM at-Home Lesson 4 - Surface Tension

Overview:

The JEdSTEM Initiative is dedicated to developing engaged, curious, and innovative Jewish minds for the modern world. This lesson is designed to be done at home as combined parent-child learning and features a simple STEM experiment, Torah story and thought-provoking discussion questions.

Experiment Introduction	
In today's lesson, we are learning about the miracle of the Parting of the Sea. Then, we are going to do an experiment to see how different substances act in water.	
Story Summary - Parting the Sea	
<p>As the people of Israel (also known as Israelites) left Egypt after the 10 plagues, they were followed by the Egypting army. Eventually the fleeing Israelites came to the Sea of Reeds which was too deep to cross.</p> <p>When asked what they should do, Moses said that G-d led them out of Egypt and would get them away from the incoming army. G-d told Moses to raise his staff and the seas would part.</p> <p>Moses did as he was told and the Sea parted into two walls of water with a dry patch in between. The Israelites then crossed through the Sea on dry land.</p> <p>As the Egyptian army tried to follow, G-d closed the sea behind the Israelities allowing them to safely cross and continue their journey to the promised land.</p> <p>Exodus 14-15</p> <p>For a more detailed version of this story follow this Link</p>	
Questions	
<ul style="list-style-type: none"> ● What would you do if you had reached the Red Sea and could not see a way to get across? ● How would you feel watching the seas part? 	

Experiment Procedure	Supplies Needed
<p>In this lesson we learned about the Exodus from Egypt and the parting of the Red Sea.</p> <ol style="list-style-type: none"> 1. Fill the large bowl with water. 2. Sprinkle black pepper evenly across the surface. The pepper flakes should float. 3. Put a little bit of dish soap on the toothpick or Q-Tip. <ol style="list-style-type: none"> a. If you don't have these, a spoon, chopstick, or your finger will also work! 4. Poke the center of the water with the soapy end of the toothpick. See what happens! 	<ul style="list-style-type: none"> ● Large Bowl ● Water ● Black Pepper ● Dish soap ● Toothpick or Q-Tip
Experiment Explanation	
<p><u>How do you think this works?</u></p> <p>The first question to answer is why does the pepper float as opposed to sinking or dissolving in the water?</p> <p>Pepper is hydrophobic, meaning that water molecules are not attracted to the pepper molecules. That means that it can't dissolve in the water, like salt does.</p> <p>The pepper flakes are able to float because they are small and lighter than the surface tension of the water.</p> <p>Surface tension is the molecules of the water sticking together which creates a barrier that the pepper cannot get through. The pepper floats on top of this barrier.</p> <p>When the dish soap is added it does its job of breaking the surface tension. This is important because this is how it helps us clean our dirty dishes.</p> <p>In this experiment, the soap causes the water to move away from the dish soap so that it can continue to have surface tension elsewhere. This movement pulls the floating pepper with it and away from the soap.</p>	

Expand the Experiment	
<p>So you did the experiment and want to know more than you can do?</p> <p>Options:</p> <ul style="list-style-type: none"> • Try this experiment with milk and food coloring instead of water and pepper. • Test our surface tension with small cups of water. Shake pepper into one and watch it float. Shake salt into another and see what happens. What else can you try? Food coloring? Sugar? Garlic Powder? 	
Wrap Up Questions	
<p>What do you think about the experiment?</p> <p>What other substances do you think would act the same way as the pepper?</p>	