I Scream, You Scream, We All Scream for Ice Cream

Target Audience: *Elementary School to Middle School*
Education Setting: *Group Activity*

Objectives:

- Provide students with an opportunity to make their own ice cream and explore the science behind this "cool" treat.

Preparation

Note: This recipe is enough for **2-3** students. Students may work in teams.

Materials Needed:

a. 4 cups crushed ice
b. 4 Tablespoons salt (table salt may be used)
c. 2 quart-size ziptop bags
d. 1 gallon-size ziptop freezer bag
e. A hand towel to keep hands warm

Ingredients:

a. ½ cup milk (The higher percentage of fat in whole or 2% milk will result in smoother ice cream texture, due to disruption of ice crystal formation.)
b. ¼ teaspoon vanilla
c. 1 Tablespoon sugar

Set up a MIX station and a FREEZE station.

At the MIX station:

- Milk
- Vanilla
- Sugar
- Measuring cups and teaspoons/Tablespoons for ingredients
- Quart-sized ziptop bags

At the FREEZE station:

- Gallon-sized ziptop bags
- Ice
- Salt
- Measuring cups for ice and salt
- Towels

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Lesson Activity

1. Mix the milk, vanilla and sugar together in one of the quart-sized bags.
2. Seal tightly, allowing as little air to remain in the bag as possible. Too much air left inside may cause the bag to open during shaking.
3. Place this bag inside the other quart-sized bag in order to protect from salt and ice leaking into the ice cream during shaking. Seal tightly, allowing as little air to remain in the bag as possible.
4. Put the two bags inside the gallon-sized ziptop freezer bag. Fill the bag with ice, then sprinkle salt on top.
5. Let all air escape and seal the bag tightly. Wrap the bag in a towel or use gloves to shake and knead the bag for 5-8 minutes, making sure the ice surrounds the smaller bags inside.
6. Once everyone has solidified ice cream in their bags, gather together as a group, take the quart-sized bags out of the gallon bag and wipe the salt and water off with a towel.
7. To serve the ice cream, students could scoop it out of the bag with spoons, or cut a small hole in the corner of each quart-sized bag and squeeze the ice cream out into bowls/cups.

"Going Further" Activities: Ice Cream Facts

Adapted from: www.Serving-Ice-Cream.com

The History of Ice Cream

China created the first ice cream recipe during the Tang Dynasty (618-917 A.D.) – but it didn't taste very much like the ice cream we know today, since it was made with different types of milk. This recipe used milk from cows, horses, water buffaloes and goats.

In 1846, Nancy Johnson invented the first hand-cranked freezer, using salt, ice and a bucket to freeze cream and sugar. The invention reduced the time necessary to make this sweet treat.

At the St. Louis World Fair in 1904, the ice cream cone was made popular. It is uncertain who invented the ice cream cone, but we do know that originally they were called "cornucopias."

Fun Facts About Ice Cream

It takes about 50 licks to lick away one scoop of ice cream.

Of all the days of the week, most ice cream is purchased on Sunday.

Kids aged 2-12 and adults over 45 eat the most ice cream.

More men (13%) admit to licking their ice cream bowl clean than women (8%).

The largest ice cream sundae weighed 54,914 pounds. It was made by Palm Dairies Ltd. in Alberta, Canada in 1988.

July is National Ice Cream Month.

Vanilla, chocolate, butter pecan, strawberry, and mint chocolate chip are the most popular ice cream flavors.

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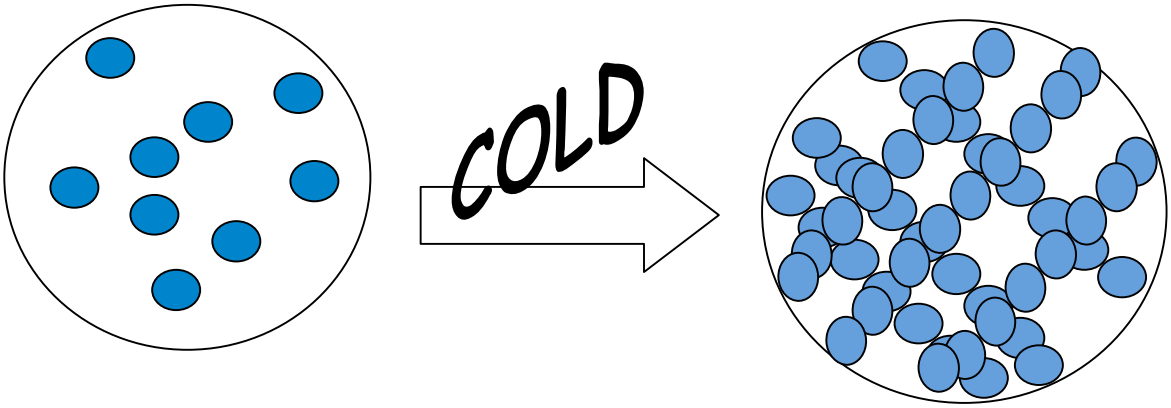
Lonely Water Molecules, Delicious Ice Cream (Upper Elementary and Middle School Students)

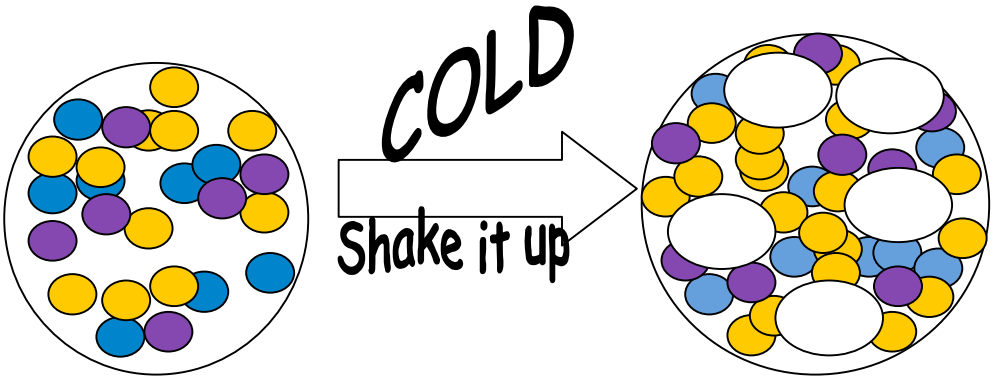
Ask students: "What happens when you freeze water?"

- Ice crystals form, turning the water into a solid. In order for this to happen, water molecules have to "find each other." This occurs by the differences in charge, as the hydrogen atoms in water have a positive charge, and the oxygen atoms have a negative charge. The hydrogen and oxygen atoms come together to form a structure that is tightly bonded.



Ask students: "Why do you think ice cream doesn't turn rock-hard like ice when you freeze it?"

- Ice cream contains molecules of water within the milk, but it also contains fats and sugars. When the temperature is lowered, the molecules of water will freeze, but they are separated from each other by the fat and sugar molecules. The "lonely" molecules of water freeze separately. If milk with a greater percentage of fat is used (Whipping Cream > Whole Milk > 2% > 1%), there will be more fat molecules. The fat blocks the water molecules from "finding one another" and prevents the ice cream from freezing together in a solid structure and forming crunchy ice crystals.
- Ice cream must be shaken or stirred constantly as it freezes in order to keep the water molecules separated, and incorporate air bubbles into the mixture. This keeps crystals small so ice cream is smooth, resulting in a soft and creamy texture.
- Lack of stirring when ice cream melts and re-freezes is the reason that ice cream often has ice crystals present. When ice cream is taken from the freezer, left at room temperature or placed in the microwave to soften it, and then returned to the freezer, crunchy ice crystals form.



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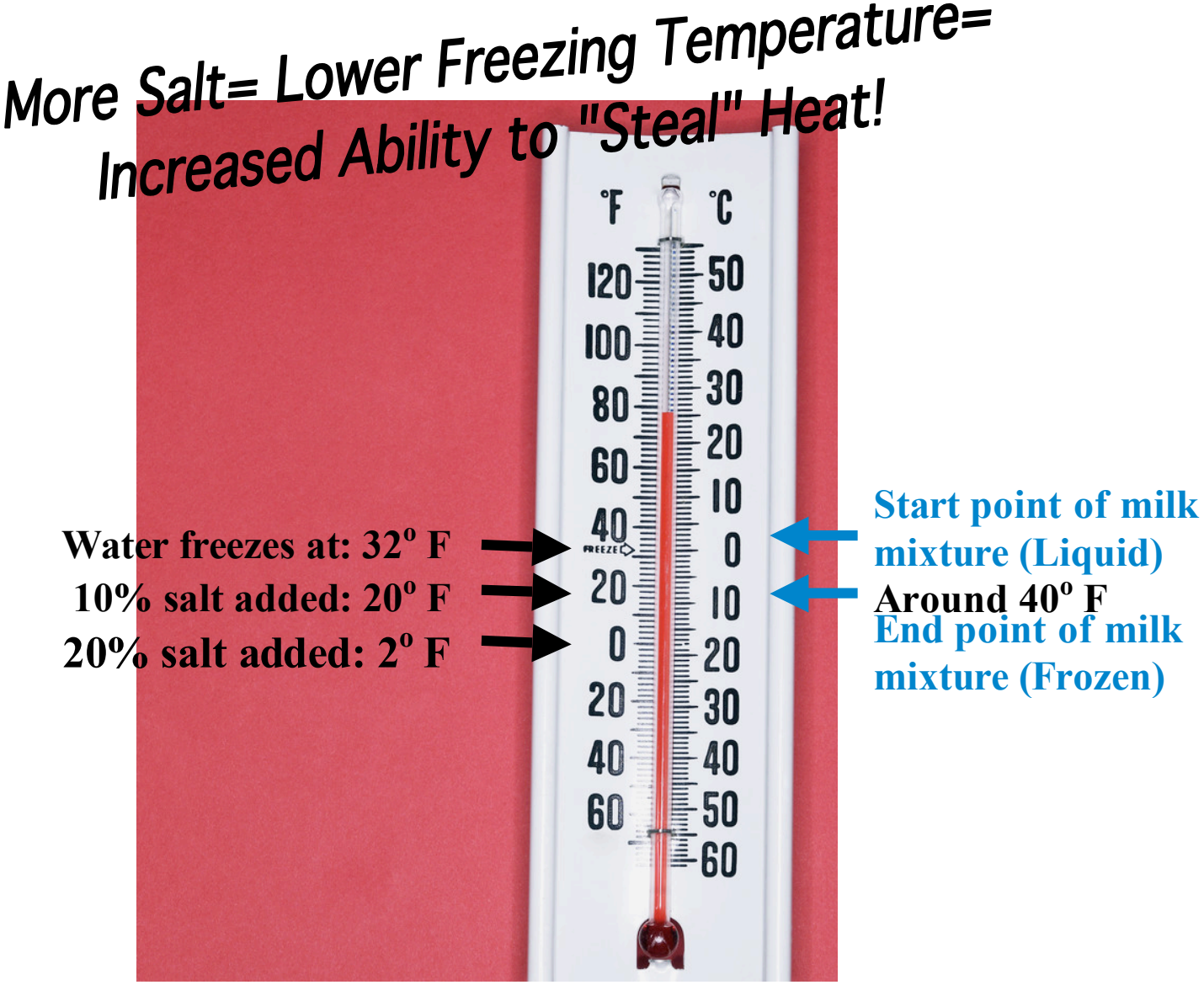
Why Did We Use Salt?* (Upper Elementary and Middle School Students)

After the activity, ask students why they think the salt was used.

Explain that just like using salt on icy roads during the winter, salt helps ice absorb heat energy (which removes heat from the surrounding environment). It lowers the freezing point of ice, causing it to melt and draw heat away from its surroundings. Show the chart below.

The milk mixture needs to lose heat energy to freeze. Where is all that heat energy going to go? Into the ice, of course. Because the ice's freezing temperature has been lowered by the salt, it now has an increased ability to "steal" heat from the milk mixture. Remember, the salt allows the ice to draw heat energy out of the milk mixture, allowing it to freeze.



**Information adapted from http://sciencesquad.questacon.edu.au/activities/ice_cream.html*

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Solids and Liquids (Elementary School Students)

Before starting the activity, explain to students that their challenge is to turn the **liquid** ingredients into **solid** ice cream. Ask the following questions to engage students in discussion.

- How is a liquid different from a solid? *(Solids keep their shape, while liquids fill the shape of whatever is holding them.)*
- What needs to happen to these ingredients for them to turn into a solid? *(They need to freeze.)*

Tell students they will use ice to chill the milk mixture. Have them predict what will happen to the ice and to the milk mixture as they make ice cream. Record these predictions on the chart below to discuss later.

Start the activity and help students notice what's happening inside the bags as time passes.

- How do the ice cream ingredients feel now?
- What's happening to the ice cubes?
- What's happening to the ice cream's temperature?

After the students taste the ice cream, compare their observations to the predictions. Ask if they can think of other examples where liquids can turn into solids, or vice-versa (examples may include popsicles melting, frozen soup defrosting in the microwave, or ice on a frozen pond).

TAKE A GUESS			
AS TIME PASSES...	Ice Cubes (Liquid or Solid)	Milk Mixture/Ice Cream (Liquid or Solid)	Milk Mixture/Ice Cream (Temperature)
WHAT DO YOU THINK WILL HAPPEN (Prediction)			
WHAT ACTUALLY HAPPENED (Observation)			

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