

Ice Cream In A Bag Lesson Plan

Lesson Overview:

Students have explored and defined matter as anything that has mass and takes up space. In this lesson the children will change matter from liquid to solid by changing the temperature. They will discover that energy causes the matter to change. They will also practice following directions and measuring with accuracy.

NY State Standards/ Elementary Science (pg. 14):

Describe chemical and physical changes, including changes in states of matter.

- Matter exists in three states: solid, liquid, gas.
 - > solids have a definite shape and volume
 - > liquids do not have a definite shape but have a definite volume
 - > gases do not hold their shape or volume
- Temperature can affect the state of matter of a substance.
- Changes in the properties or materials of objects can be observed and described.

Background Knowledge:

States of matter are the forms that different phases of matter take on. The states are solid, liquid and gas. In a solid state, the matter maintains a fixed volume and shape. The particles that make up a solid are closely packed together and do not have much space to move. Thus, solids keep their shape. Liquids flow and do not have a definite shape. A liquid maintains a fixed volume but adopts the shape of its container. The particles that make up a liquid are farther apart than solids, and they can move around more readily. This allows liquids to flow and spread out. A gas expands to occupy whatever volume is available. Liquid water turns into steam, a gas, when it is heated to the boiling point, 212 degrees F. There is also a fourth state of matter, plasma, which is a type of gas, which conducts electricity. Gases also flow and do not have a definite shape. The particles that make up gases are farther apart than liquids, so gases can spread out in all directions to take the whole space of a container.

Different kinds of energy can cause matter to change states. Most children have experience with ice cream melting on a hot day or ice cubes melting in a glass. When a substance melts, it goes from a solid to a liquid. Heat causes the temperature of the substance to increase and particles to gain more energy. They are able to move faster and flow, causing a solid to change into a liquid.

Different objects (types of matter) can be mixed together. A mixture is two or more things put together – like salads, soups, cakes, etc. Some mixtures can be easily separated – like picking the tomatoes out of your salad. Some mixtures are hard to separate – like separating the chocolate from your chocolate milk. When a solid (like chocolate powder) completely mixes with a liquid (like milk), we say that the solid has completely dissolved into the liquid. Some objects can be mixed together to create something completely new. We can use a solid and a liquid to create a gas (like the air we

breathe - CO₂) or we can use different liquids to create a solid. If we change the temperature of some objects, we can create something completely new like ice cream. Heating an object can evaporate it (if it's a liquid) or melt it (if it's a solid). By cooling or taking heat away from a liquid, we can freeze it or turn the liquid into a solid, like ice cream!

Lesson Objectives:

1. To introduce three states of matter.
2. To describe the properties of solids, liquids and gases.

Student Activity:

1. Begin by discussing the characteristics of milk (liquid state).
2. Explain how we are going to change the liquid form of matter into a solid.
3. Follow directions for making ice cream.

Materials Needed:

- * 1 cup whole milk
- * 1/4 cup sugar
- * 1/4 tsp vanilla
- * 1 tbl chocolate syrup
- * 3 cups crushed ice
- * 1 gallon size Ziploc bags
- * 2 sandwich size Ziploc bags
- * 1/4 cup rock salt

Directions:

In one of the small Ziploc baggies, mix together the milk, chocolate, vanilla and sugar. Squeeze excess air from the baggie and zip baggie tight. Double check for a tight seal. Put the small bag inside the gallon size bag and fill the bag with ice, then sprinkle salt on top. Again let all the air escape and seal the bag. Shake the bag, making sure the ice surrounds the cream mixture. Five to eight minutes is adequate time for the mixture to freeze into ice cream.

4. Possible Questions for Discussion

- * How are the characteristics of the liquid milk different from the solid ice cream?
- * In order to change the liquid to solid, what had to happen?
- * What happened to the heat energy that left the milk?
- * What are the variables we could change in making ice cream?
- * What ideas do you have for freezing the ice cream faster?
- * Why did the outside of the bag get wet?

Assessment:

In journals use a Venn Diagram to compare and contrast the characteristics of liquid and solid matter. Then, describe what caused the change from liquid to solid. Give examples of other matter than changes from one state to another and explain the cause.

Reinforcement Activities:

Particle Dance Party

Have your whole class model the particles that make up solids, liquids, and gases. To model solids, have students make a shape and link arms together. They can dance in place but keep the whole shape. To model liquids, students can place their hands on each other shoulders and walk slowly around the room. They can dance and observe that they have more space to move. To model gases, have students dance about the room without touching each other. They should observe that they have much more room than before and are able to spread out freely.

Ice Cube Meltdown

Bring in a bag of ice for your students. Divide the students into small groups or pairs and have them find the fastest way to melt an ice cube. Remind your students that heat can change matter and adding more heat might make matter change faster. They may want to put the ice cubes in a sunny spot, warm them up in their hands, or just put them in a cup on their desks. Have students time how long each method takes. Which method was best? Have groups discuss and share their observations and findings with the class.

Evaporating into Thin Air

Divide students into small groups and have them pour a cup of water. Make sure they label the cup with their group name. Then have them record the height of the water level with a ruler. Have students place the cups in a sunny spot outside. Throughout the day have students measure the water level. What happened to the water level? This experiment can be done over the course of a week.

Oobleck

Oobleck is a mixture of cornstarch and water. As a mixture of a solid and a liquid, it takes on properties of both, and behaves in unpredictable ways. In liquids, the bonding or attraction between molecules is weak, allowing the molecules to easily flow past one another and rearrange, giving liquids their characteristic properties. In solids, the bonding between molecules is much stronger. The molecules cannot be easily rearranged, so the solid keeps its shape.

