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Fifth Grade Lesson Plan: Solid, Liquid, and Gas

Getaway Special Team 2009

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Lesson Plan – 5th Grade

Unit Theme: Physical and Chemical Changes

Subject Area: Science

Lesson Title: Solid, Liquid, and Gas

Number of Learners: Entire class

Grade Level: 5th

Time Needed: 30 minutes

Curriculum

Standard 1

Students will understand that chemical and physical changes occur in matter.

Objective 2 – Evaluate evidence that indicates a physical change has occurred.

Objective 3 – Investigate evidence for changes in matter that occur during a chemical reaction.

Materials Needed

- Corn starch
- Water
- Baking soda
- Vinegar
- Food coloring
- Beaker
- Legos
- Balloons
- Speaker
- Amplifier
- Tone Generator
- Container for cornstarch and water
- Wooden mixing spoon
- Ice

Learning Objectives

Students will understand that matter has different phases; solid, liquid, and gas. They will also be able to distinguish the difference between physical and chemical changes.

Background Knowledge

Physical change is a change that doesn't alter the substance's chemical identity. One example is water changing from ice to liquid water to steam.

Chemical change occurs when chemical bonds are broken and new bonds are formed between different atoms. You can't return it back to the original state. One classic example is fire.

Instructional Procedures

Start the lesson with a mixture of corn starch and water bouncing around on a stereo speaker. Ask the students what they think is happening and then begin the discussion on properties of

matter. Teach that the corn starch is a solid and water is a liquid and thus they can act like both a liquid and a solid, known as a non-Newtonian fluid.

Ask students what they know about solids, liquids, and gases. Use various Lego configurations to show how the molecules in solids, liquids, and gases are organized differently. Start by building a set that is compact, like a rectangle, portraying a solid, where the molecules are close together. Next start pulling Lego pieces off one by one showing that molecules in a liquid have a little more freedom and energy to move around. To demonstrate gas molecules, throw the Legos in the air in all directions. Explain to the students that the molecules in a gas don't want to be next to one another so they disperse in any direction possible. Also explain to the students the different energy levels each phase state has; solids have a low energy, liquids a little more, and gases have the most.

Once the students understand these properties of matter, ask them how matter changes between the different states. Use the analogy of Legos again. Build a solid cube out of red blocks and another out of blue blocks into a rectangle.

-For a physical change, show the beginning solid pieces. Then piece by piece take them apart and explain that it is now a liquid. Finally move the Legos in all directions for a gas. Note that the molecules never changed, just changed phases.

-For a chemical change, use the red and blue cube sets. Explain to the students that they are different molecules, the red being a solid and blue a liquid. Then put some energy into the molecules and start to break them apart and add combine both blocks together to form one cube. Explain to the students that the two colored block acts like a liquid solution such as salt water. Finally put more energy into the molecules and pull them apart and spread them out from one another. This is creating a gas and the molecules want to get as far away as they can.

Demonstrate more physical changes by using the following experiments.

-Ask the students how much snow they get where they live. Then ask them what their parents do after they have shoveled snow from the sidewalks. Explain to them the purpose of putting rock salt on the sidewalks. The rock salt lowers the freezing point of the water and therefore, the ice melts and becomes a liquid. This is a physical change.

-Show the students some ice and water in separate containers. Ask them the difference between the two and if the molecules are the same. Explain that the difference between the ice and water is due to the amount of energy that is in them and that it is a physical change. Then ask the students what happens when they boil water at home. Explain to them that the steam that comes off the water is just water in a gas form and can condense back down to a liquid again once the temperature has cooled down. These physical changes happen when heat is either added or taken away. Ask the students if they can think of any other physical changes. Other examples may include crumpling a piece of paper, cutting open an apple, inflating or deflating a basketball, breaking glass, or breaking a pencil.

Demonstrate more chemical changes by using the following experiments and explain that chemical reactions occur when molecules of matter are combined to make a new substance. Also some clues to tell if a chemical change has occurred include a change in smell, light or heat is given off, or production of bubbles or gas. Some examples include fire, rust, baking, fall leaves changing color, and moldy cheese.

-Add some vinegar to a beaker and ask the students what type of state it is in. Next show the students some baking soda and ask what state it is in. Then add some baking soda to the vinegar and put a balloon over the beaker opening. This will cause the mixture to react and bubble up causing the balloon to fill up with a gas called carbon dioxide. Ask the students what type of change just occurred and what they think is in the balloon. This will help them see the change from a solid and liquid state to a gas state. This will also help them understand that although a chemical change has occurred, none of the material that went into the experiment disappeared, it just changed state.

Assessment

A performance based assessment would follow this activity. Perform the baking soda and vinegar experiment again for the students to solidify the understanding of physical and chemical changes as well as the states of matter. Start by adding vinegar to a beaker and ask the students what state the vinegar is in. Then add green food coloring to the vinegar and ask what type of change occurred, physical or chemical. It is a physical change. Show the students some baking soda and ask them what state the baking soda is in. Then add some baking soda to the vinegar and ask the students if this is a physical or chemical change and why. This is a chemical change.

Extensions

-Add a few drops of food coloring to some water and ask what type of change this is. It is a physical change. Then add bleach. This will clear up the water in a few minutes. Ask what type of change just happened, chemical or physical. This is a chemical change. Next add baking soda to water and ask what type of change, chemical or physical. This is a physical change due to its solubility. Finally add baking soda to vinegar and ask what type of change this is. It is a chemical change.

-Explain to the students what a control factor is in an experiment. Ask the students what they think happens when you bake a loaf of bread and the reaction that takes place. Then have them make four different loaves of bread at home. One with the correct amount of yeast, another with no yeast, another with half the amount of yeast, and the last with double the amount of yeast. Have the students bring the loaves to class and discuss the differences in the loaves due to the various amounts of yeast. Also have them come up with a hypothesis or conclusion for the reaction differences due to the varying amounts of yeast.