

Experimenting with Physical Changes

4th Grade

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References:

- “Matter, Physical and Chemical Changes” lesson plan from 4th grade curriculum guide

Benchmarks:

PS-1, PS-3 & PS-4 (Benchmark A & B): Identify characteristics of a simple physical change. Describe objects by the properties of the materials from which they are made and that these properties can be used to separate or sort a group of objects. Explain that matter has different states and that each state has distinct physical properties. SI-3, 4, 5, 6 (Benchmark C): Develop, design, and safely conduct scientific investigations and communicate the results.

Objectives:

In this lesson, the students will learn that a physical change is a change in size, shape, or state of matter of a substance. Some physical changes are more difficult to determine than others because two substances can dissolve in each other. However, if one of those substances is removed, the other will return in its original state, to show that only a physical change took place, because no new substance was formed.

Materials:

- Spaghetti
- Water
- Pan
- Hot plate
- Unopened soda bottle
- Large plastic bowl

Materials needed for each group of three:

- Warm water
- 3 Plastic clear cups
- Eyedroppers
- Popsicle sticks
- Jell-O
- Salt
- Sugar
- 2 Large plastic trays

Initial Demonstration:

Begin by boiling water on a hot plate in a cooking pan or large glass beaker. Make sure that the students understand that a change in state is taking place with water as it boils. Next take thin spaghetti noodles and place them in water to boil. Have the students identify the three states of matter when preparing spaghetti for dinner. Students will record their predictions about the states in their physical science journal. Discuss the observations as a class to determine what falls under each category. To prove that a physical change was taking place, show the students the uncooked spaghetti, followed by the spaghetti that has been boiled. Even though it looks and feels different, it has undergone a physical change because it is still spaghetti in the end. Another example from the kitchen that contains all three states of matter is a full bottle of unopened soda. Have the students list the three states of matter in a soda bottle in their journal. Discuss the observations, only to realize that the gas is very difficult to see. To show that gas is present shake the soda vigorously, then open the cap inside of a large bowl to watch the soda spew and bubble. The presence of gas becomes clear to the students, as well as a physical change. The physical change occurs when the gas bubbles return back to liquid soda and collect in the bottom of the bowl.

Target Observations:

- Spaghetti noodles change their shape, size and texture when boiled, but they still remain spaghetti.
- Water vapor is in the form of gas when the water is boiled, undergoing a change in state, which is a physical change.
- All three states of matter are present in soda bottle, even though the gas is more difficult to observe until shaken.

Target Model:

- A physical change requires a change in the size of the object, shape of the object, or the state of matter. Even though solids are dissolved in water, if the water is evaporated away, the solids will return in their original state, thus indicating a physical change rather than a chemical change.

Procedure:

Per triplets of students, have them collect all the materials needed, as listed above in the materials section. Tell the students they will be working in triplets to set up their experiments. Inform them that they will be performing an experiment that will have to sit for at least a week before checking the results. Remind them that there are several clues that indicate a physical change is taking place, the main one being a change in state.

Students will label each cup with the following: cup 1 – salt, cup 2 – sugar, and cup 3 – Jell-O. Students will place one pinch of each solid in their respective cups. To all three cups, add 10 full eyedroppers full of water until the solid dissolves. Some students may have to agitate the mixture with the popsicle stick in order to dissolve all

the solids. Once the students have completed these directions, collect the solutions they have prepared and place them all on a large plastic tray. Place the trays in a sunny window and allow them to evaporate over several days. After several days, check the cups to observe what was left in the cups. Observations should be recorded in the student's physical science journal. Students should discuss their results with the others at their table and they must be able to identify any chemical or physical changes that occur. To conclude, a class discussion about physical changes should take place to emphasize that even though the solids changed their state for a while, they eventually returned back to their original state.

Target Observations:

- All three solids dissolved in warm water after being stirred becoming a liquid.
- Jell-O was more difficult to dissolve than the others.
- The solids reappeared after several days because the water evaporated away.
- A physical change took place, despite the disappearance of the solids for while.

Summary:

Students have learned that even though a solid disappears when placed in water, it will return to its solid state once the water is gone. Only a physical change has occurred based on the definition of a physical change. Physical changes are characterized by change in color, shape, size, texture, or state of matter. Since a change in state was observed with all three solids, a physical change was represented using three different solids.