

Solids & Liquids & Gasses, Oh My!

Description

The three states of matter are solid, liquid, and gas. Talk about ice as a solid, water as a liquid that takes the shape of its container, and steam as a gas that fills the room. Once your child learns about matter, they can identify objects as to what state they're in.

Instructions

1. Fill a bowl with ice. Let your child touch the ice. Talk about solids and their properties. A solid matter has a definite shape and volume that cannot easily be changed.
2. Now let the ice melt, which will be the longest part of this science experiment unless you speed things along. You can point a hairdryer at the bowl or put it into a larger bowl with hot water in it. You could also go about your daily business and simply come back to the experiment later. If you choose this route, try to start the experiment in the morning to allow plenty of time for the other two parts. Talk about how water is still matter, but it is free-flowing and takes the shape of whatever container you put it in. Put the water from your bowl into different shaped containers so your child can observe this.
3. Finally, pour the water into a pot or kettle and heat the water on the stove. As it begins to boil, steam will rise, which is a gas. Have them watch the condensation droplets form as it touches whatever is above your stove and cools back down. Let them get near enough to the steam to feel the warmth and extra humidity of the surrounding air. Talk about how gas still takes up space but has no shape since it goes everywhere and seems to disappear.

Materials Needed

- Ice cubes
- Large bowl
- Stove
- Pot or kettle
- (Optional) containers of other shapes (vases, cups, glasses, etc.)
- (Optional) Ice cube tray

Why is this a great thing to do?

Your child will learn about physics, experience sensory play, practice patience, and enjoy a little curiosity.

Introduces your child to physics.

Your child will get their hands on a foundational physics concept by interacting with water as it transitions between all three states of matter: solid, liquid, and gas. Experimenting with these concepts will make learning about them in an academic setting much easier later.

Experiences sensory play.

Experiencing many different tactile sensations at an early age is vital to avoid timid and picky interactions with new sensations as children grow up. Using describing words with your toddler as they explore will also help expand their vocabulary. Sensory play will further provide an appropriate avenue for playing with things they might find curious.

Practices patience.

Patience is required waiting for water to generate steam, or to make ice. Patience is an invaluable skill and can have a positive influence on many aspects of their life.

Piques their curiosity.

Being curious about how this activity develops fosters curiosity in other areas as well. Curiosity can lead to a great deal of learning! Developing a habit of being curious encourages a life-long learning mentality.

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Make STEM Connections

Help your child develop a more in-depth understanding that matter comes in different forms: Solids, liquids, and gases. A solid keeps its shape, a liquid takes the shape of its container, and gas fills its container.

Learn about science with the Berenstain Bears.

There is an excellent [Berenstain Bears book](#) that teaches several science concepts, including states of matter using water, ice, and steam. The wording is suitable for young children, so it makes a great introduction to many scientific concepts, as well as provides ideas for simple experiments.

Talk about fire safety.

Many gasses are almost invisible, making them hard to see. If you have a gas stove or candle lighter at home, what you are seeing when someone turns it on to cook is not the gas, it is the fire burning the gas up. Fire can't burn without another kind of gas too, oxygen, the gas we all breathe! That is one of the reasons why, if there is ever a fire, you aren't supposed to open doors because that provides the fire with more oxygen and might make the fire bigger. Try making a campfire outside or in your fireplace and see what happens when you blow or use bellows on the flames.

Make some slime.

Your slime will stretch if you pull it slowly, but it breaks if you pull it too fast, because slime is a non-Newtonian fluid. Non-Newtonian fluids like Oobleck, quicksand, and silly putty change state from solid to the liquid-based matter depending upon the pressure that is applied to them. Have your child experiment to see how it works. To make the slime:

- Pour 1/4 cup glue into a large bowl. Add one tablespoon water and stir until combined. Slowly add 1/8 cup liquid starch and mix until thick and slimy, making sure there is no unmixed glue hiding in the center of your slime.
- Knead the slime with your hands. It may be easiest to remove the slime from the bowl and use a clean, flat surface for kneading. If the slime is still too sticky, return it to the bowl and add additional starch, a little bit at a time, and knead until it's the right consistency.

Next Generation Science Standards (NGSS) Correlation

2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

When your child examines water in a solid state (ice,) a liquid state (water,) and a gas state (steam,) they can observe and describe how water has different physical states when heat or cold is applied to it. This activity can be extended by asking your child to complete [a worksheet](#) by sorting pictures of various items into one of the three categories: Solid, liquid, or gas. Items can include a steaming cup of coffee, tornado, sunblock, popsicle, fan blowing air, milk, glue, ocean wave, snow, rain cloud, crayon, wind, and more.

Talking Tips

"What do solids feel like?"

"What does the liquid feel like?"

"What does gas feel like?"

"Do you think all solids feel the same?"

"There are many gasses that you can't feel. Scientists have to develop special tests to detect them."

"What are some other solids we use every day? Other liquids? Are there other gasses we can see?"

Tips & Extensions

Do a scavenger hunt around the house for items that are solids and liquids. Gas might be a bit trickier, so you may want to start by including just one item to search for, such as clouds outside your window.

Give your child a second bowl and a pair of tongs to play with the ice and transfer it between the bowls. Now your science experiment also includes sensory play and fine motor skills practice!

Close your bathroom door and run a hot bath to show steam again in a place where the gas can fill the room more thoroughly.

Different liquids boil at different temperatures. Purchase a [hand boiler](#) to play with this concept if it interests you.

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Next Generation Science Standards (NGSS) Correlation (con't)

2-PS1-2: analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

When your child examines water in a solid state (ice,) a liquid state (water,) and a gas state (steam,) they will recognize that water serves specific purposes in each state. In a solid state, water can cool down warm or hot liquid. In a liquid state, water can be used for drinking, cleaning, and cooking. In a gas state, water can humidify a room or evaporate to the clouds as part of the never-ending water cycle. This activity can be extended by completing [the "Root Beer Float: Solid, Liquid Gas Experiment" worksheet](#). Ask your child to identify the root beer as a solid, liquid, or gas. Ask your child to identify ice cream as a solid, liquid, or gas. Ask your child to predict what will happen when the root beer is poured over the ice cream using a transparent glass. Observe the bubbles: Solid, liquid, or gas? Discuss the results.

2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

When your child changes water from a solid state (ice) to a liquid state (water) or a gas state (steam,) they will observe that it can also be returned to its former state by re-freezing water or collecting steam in a covered pot on the stove and watching the moisture slowly return to water droplet in the pan as it cools. This activity can be extended by discussing "reversibility" and testing other matters. Examples: Melt a crayon in a paper cup in the microwave- ask your child if the melted crayon can return to a solid shape to be used as a crayon again (yes.) Now, boil dry spaghetti- when it is done, ask your child if the spaghetti can be returned to its former dry state (no.)