

Matter Madness and Making Oobleck!

Activity Rundown:

Do you have a mass? Do you take up space? If you answered yes to both these questions, then I have some exciting news for you: *you are made of matter*! Matter is what makes up everything in our universe, from the smallest bug in your yard to the largest star in the sky. As you probably noticed, matter can exist in three main states: solid, liquid, or gas. Some substances, like water, can exist as all three as ice, water, and water vapour! But what happens if a substance is a mixture of two different states? That's what we'll be investigating in this hands-on, fun oobleck experiment!

You will need:

- + Water
- + Cornstarch
- + Mixing bowl
- + Spoon
- + Optional: Food colouring

Let's do it!

- 1. In a mixing bowl, combine 1.5 cups of cornstarch and 1 cup of water.
 - a. If you want to make your oobleck a fun colour, this is when you would add whatever food coloring you would like! Since we're going to be playing in it with our hands, we strongly suggest you wear some plastic gloves if you decide to dye your oobleck. Food colouring does stain!
- 2. To test if you've made the right consistency, take a handful of your oobleck and press it into a ball shape by making a fist with your hands. Upon doing this, the oobleck should become hard! Next, release your fist and the oobleck should revert back into a more runny state.
 - a. If your oobleck is too wet, add a half spoonful of cornstarch.
 - b. If your oobleck is too hard, add a couple of drops of water.
 - c. It might take a while to get the perfect consistency, but believe us when we say it's worth it!
- 3. Now you have yourself your very own batch of oobleck! Here are some interesting experiments you may want to try out:
 - a. Try taking a spoon and vigorously mixing your oobleck. Is it more difficult to mix while stirring fast or while stirring slow? Why do you think speed makes a difference?



- b. Hit the oobleck with the palm of your hand. Next, slowly dip your palm into the oobleck. Are the feelings the same or different?
- c. Let the oobleck sit in a glass for a couple of hours. What do you think will happen? Make some hypotheses (predictions) and come back later!
- d. If you have enough cornstarch and a plastic pool (or long container) hanging around, try walking, running, and crab-walking across an inch thick layer of oobleck!



Messy, outdoor fun!

Once you're done playing and investigating your oobleck, simply pour it into a garbage bin. DO NOT pour it down your sink as it might cause blockage problems!

If you accidentally make a mess while playing with your oobleck, allow the patch to dry. It will go back to its original cornstarch texture and can then be swept or vacuumed.

Background:

What is Matter?

- Matter is everything around you! Atoms and compounds are all made of very small parts of matter. Those atoms go on to build the things you see and touch every day.
- Matter is defined as anything that has mass and has a volume (i.e. Takes up space).



SMALL PARTS COMBINE TO FORM LARGER STRUCTURES



Three States of Matter:

- **Solid matter** is composed of tightly packed particles. A solid will retain its shape; the particles are not free to move around.
- Liquid matter is made of more loosely packed particles. It will take the shape of its container. Particles can move about within a liquid, but they are packed densely enough that volume is maintained.
- **Gaseous matter** is composed of particles packed so loosely that it has neither a defined shape or a defined volume. A gas can be compressed.



What is Oobleck?

• Oobleck is a substance called a **"Non-Newtonian Fluid"**, which was named in honour of Sir Issac Newton. This brilliant scientist is probably best known for his theory regarding the law of gravity.



The "Falling Apple" Moment.



- Typically, liquids take on the shape of the container they are poured into. We call these normal liquids Newtonian fluids. But some fluids don't follow this rule. We call these strange liquids non-Newtonian fluids.
- Non-Newtonian fluids change their **viscosity or flow** behaviour under **stress**.
 - <u>Viscosity</u>: the state of being thick, sticky, and semifluid in consistency. A good example of different viscosities would be the comparison of molasses and milk. Molasses is very thick and will run slowly if poured, giving it a high viscosity. Milk on the other hand is runny and pours out of a container quickly, giving it a low viscosity.
 - <u>Stress</u>: In science, stress means that a force is applied to a body. The result of that stress is described as strain. For example, the force of hitting a metal sheet with a hammer would cause an indentation (strain) on the metal.
- As you noticed while playing with your oobleck, its viscosity increased with the amount of force applied to it! Basically, the harder you squeezed or hit your oobleck, the more solid it became.
- Other common Non-Newtonian Fluids include: ketchup, honey, and toothpaste.

How does oobleck work?

- Oobleck is a **suspension** of starch in water. The starch grains remain intact rather than dissolving, which is the key to its interesting properties. When a sudden force is applied to oobleck, the starch grains rub against each other and lock into position. This is called **shear thickening**.
- When oobleck is at rest, the high surface tension of water causes water droplets to surround the starch granules. Water acts as a liquid cushion and allows the grains to flow freely. The sudden force pushes the water out of the suspension and jams the starch grains against each other.





There is a fourth state of matter called **plasma**! This state is created by adding energy to a gas so that some of its electrons leave their atoms. Stars (including our Sun) are made of plasma.



Resources:

https://scienceexplorers.com/what-is-oobleck/ https://www.sciencelearn.org.nz/resources/1502-non-newtonian-fluids



Reach out!

We would love to hear from you about all the amazing STEM projects you are doing at home! Show us your finished products on any of the following social media platforms by tagging us or by using the following hashtags. We hope these projects have brought some excitement to your day during these difficult times.

Let us know how we did! Please <u>click here</u> to fill out a short survey on how well we did and what you would like to see more of in the future. Thank you!

Twitter: **@MyMindsInMotion** Facebook: **@mindsinmotion2014 & @ucactiveliving** Instagram: **@ucalgaryactive**

> Please use the following hashtags! #ucalgarycamps #ucalgarytogether