# 15 Minute Family STEAM: Ooblek

<u>Supplies:</u> Cornstarch Food Coloring (optional)



Needed From Home: Water Bowl to mix in Spoon to mix with

1. Add the water to a bowl.

2. Add a small amount of food coloring to the water. Don't add too much because it can stain skin and clothing

3. Children may like to rub some cornstarch between their fingers before they add it to the water. The starch has an interesting, silky feel.

4 Gradually add the cornstarch to the water and mix with a spoon (or your hand).

5. Once you've added 1 cup of cornstarch, add some more slowly and start mixing with your hand so that you can feel when the oobleck is ready.

6. Squeeze the oobleck as you add the cornstarch. If it forms a solid ball as you squeeze and then liquefies when you stop squeezing, it's ready to use.

7. If you make a mistake during mixing, add extra water or cornstarch until the oobleck forms.





--Squeeze some oobleck to make a solid, then open your hand and watch the solid turn back into a liquid.

--Roll some of the material into a ball. Open the hand that is holding the ball and watch the solid change into a liquid.

--Create an oobleck ball and try to pass the ball to someone else before it liquefies. (This is potentially a very messy activity.)

--Try bouncing an oobleck ball on the rest of the oobleck.

--Measure how long it takes for strands of liquefied goo to drip into a container from a specific height.

--Rest your fingers on the surface of the oobleck and let them sink, then try to pull your fingers out quickly. Find out how fast you can move your fingers through the goo.

--Try using a hand or fist to slap or hit some oobleck. A large aluminum tray is good for this experiment.

--Fill a large container (or two smaller containers) with oobleck. Try walking on the goo. You will have to move your feet rapidly to avoid sinking.



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## What is Ooblek?

Ooblek is a Non-Newtonian Fluid. It is a strange and very entertaining material. It becomes a solid wh<mark>en pressed, hit, or shaken and then returns to its liquid state when the stress is removed. Exp<mark>erimenting with O</mark>obleck is not only enjoyable but also illustrates some interesting science facts.</mark>

#### What Are Newtonian Fluids?

Most fluids are classified as "Newtonian" fluids. They're named after Isaac Newton, the famous scientist who lived from 1643 to 1726. He made many extremely valuable contributions to our present knowledge of science. Newton stated that fluids have a constant viscosity (ability to flow) if the temperature is kept constant. Applying a force or stress to the fluid doesn't change its viscosity.

An example of a Newtonian fluid is water. If you press your hand on water in a container, the water doesn't resist the force that you're creating or change its viscosity and your hand falls into the water. It you try to walk on the water, you sink.

#### What Are Non-Newtonian Fluids?

Non-Newtonian fluids behave differently from Newtonian ones when a force or stress is applied to them. If you press, hit, or shake a non-Newtonian fluid, its viscosity changes. In some fluids the viscosity increases while in others it decreases. In oobleck, the viscosity increases with stress as the oobleck resists the applied force and the liquid becomes a solid.

#### Why Does Oobleck Solidify Under Stress?

Oobleck is a colloid, which is a mixture consisting of large but still microscopic particles suspended in another substance. Cornstarch particles are spread through the water in liquid oobleck but aren't dissolved in it. The starch particles exist as long chains.

When the oobleck is not under pressure, the cornstarch chains and water molecules slide past each other and the oobleck is a liquid. When pressure is applied, the cornstarch molecules are pushed together and water molecules are pushed out of the way. Friction increases as the cornstarch molecules come into contact. The starch molecules can no longer slide over one another and the oobleck appears to be a solid. When the pressure is removed, water moves in between the starch molecules again and the oobleck returns to its liquid form.



Never pour oobleck or cornstarch down the drain. The drain may block if liquid oobleck solidifies inside it. Instead, pour or scrape the material into a garbage can. The dried material becomes a powder and is easy to brush away.

Wash your containers and hands (and any other body parts or clothing covered with oobleck) only when most of the material has been removed and put in the garbage container. Warm water will help to remove oobleck remnants from hands.

Taken in part from owlcation.com/academia



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