MIND TREKKERS
Oobleck (Small Scale) Lesson Plan

Amount of time Demo takes: 1-30 min variable on setting
Materials:
1. Cornstarch 1 cup
2. Water 1 cup
3. Bins, bowls or other container to make and play with the Oobleck in.
4. Scrappers for cleanup
5. Tough trash bags to hold oobleck after working with it.

Set up instructions:
1. It is a 1:1 ratio, of cornstarch to water. 1 cup cornstarch to 1 cup water, you can make as large or as small a batch as you want.
2. Mix cornstarch and water up in your container, you can have students mix and do the measuring.
3. Make sure your students know that oobleck can not go down the drain, it needs to go in the trash.

SAFETY!
1. DO NOT PUT DOWN DRAIN! When water is used to wash oobleck down the drain, the oobleck will thicken under the force and cause a massive clog. ALWAYS throw oobleck in the trash.
2. Tell students that the oobleck is not to go in their mouths. While it is edible, it does not taste good and lots of students are putting their hands in it.
3. Keep excess water off the floor to prevent slipping.

Lesson’s big idea
Non-Newtonian Fluids are liquids who's density changes under certain conditions. When force is applied, the density of oobleck increases so much, it acts like a solid.

Instructional Procedure

Background information
1. This lesson demonstrates the states the states of matter, solid and liquid. The oobleck can show both states. When discussing states of matter solid, liquid and gas this demonstration is a hands on way for students to experiment with a non-Newtonian fluid.
2. Most fluids are what is called a Newtonian fluid. Newtonian fluids are incompressible, and therefore have a single measurable density. Water is an incompressible Newtonian fluid. This
principal of incompressibility is the reason things like hydraulics work. If you apply force to water, the water transfers the force instead of compressing. However, with things like foam, when force is applied, the material compresses, allowing the force to disperse throughout the material. This is why it still hurts to hit water (think of a belly flop), but not fall onto a foam mat.

Non-Newtonian fluids are compressible. This means that they don’t have a single measurable density, the density is actually a function of force applied and time. Oobleck is a prime example of a compressible fluid. When force is applied, the fluid compresses, getting more dense.

This works because oobleck is not actually a solution, but a suspension. This means that the cornstarch doesn't dissolve in water. The cornstarch is really just hanging around floating suspended in the water When you apply force to oobleck, such as a foot hitting the surface, the water (which is incompressible) simply moves out of the way, and the cornstarch molecules get closer together. The closer the cornstarch, the more dense the liquid will feel. It is important to remember that oobleck is always a liquid, its simply a very dense liquid (like peanut butter).

**Assessment (How do you know your audience understood?)**

**Sample questions you can ask:**

1. What two states of matter does oobleck show?
2. What happens when you apply pressure to the oobleck? What happens when you release the pressure on the oobleck? (try punching it)
3. Can you throw a ball of oobleck?

**Conclusion**

Newtonian fluids, states of matter

**Clean Up**

Clean up between demonstrations if needed. When completely finished gather all materials listed for this demonstration and make sure everything is accounted for. If something was used up, broken or damaged. Let someone know so it can get replaced or fixed. Oobleck can not go down the drain, put it in a trash bag.

**References:**

**National Standards**

**Oobleck (small scale) lesson plan bullet points**

- Oobleck is a Non-Newtonian Fluid, Non-Newtonian Fluids are liquids who's density changes under certain conditions. When force is applied, the density of oobleck increases
so much, it acts like a solid. Water is a Newtonian fluid, it has a single measurable density and cannot be compressed.

- Non-Newtonian fluids are compressible. This means that they don’t have a single measurable density, the density is actually a function of force applied and time. The cornstarch is suspended in the water, it is not a solution. The cornstarch particles can move closer together and compress.

- Recipe is one to one, 1 cup water to 1 cup cornstarch