Western Engineering Outreach

Oobleck

Grades K-2

Meet Today's ENG HERO!

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To learn more about Dr. Zhang visit:
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Learning Goal:

- To understand different properties of solids, liquids, and gases
- Curriculum Connections: Grade 2 - Properties of Liquids and Solids

Materials Needed:

- 1 ½ - 2 cups of cornstarch
- 1 cup water
- Bowl
- Spoon
- Food colouring, if you want your oobleck to be a certain colour
- Newspaper, to protect workspace (oobleck can be messy)

Engineering and Science Connections:

What is chemistry? What is chemical engineering?
Chemistry is a branch of science that studies matter and its interactions. Engineering is the practical application of science and math to solve problems. Chemical engineers work with chemicals. So many everyday things have chemicals in them like medicines, cleaning products, makeup, and artificial flavours. Chemical engineers can work in any of those fields and many others.

The Three States of Matter
Anything that takes up space is called matter. Air, water, rocks, and even people are examples of matter! There are three classifications of matter that are important to understand: solids, liquids, and gases.

A solid is a form of matter that keeps its shape. The molecules in a solid are packed very tightly and close together, which is why solids are so hard! Examples of solids could be a rock or a chair. Can you think of any solids around your home?

Matter in a liquid state moves freely and flows. The molecules in a liquid are still held together by a force of attraction, but not nearly as tightly as a solid. As a result, a liquid will take the shape of its container, unlike a solid. Some examples of liquids could be water or paint. Can you think of any liquids around your home?

Matter in a gas state moves freely and quickly. There is almost no force of attraction between gas particles so the molecules will move freely around any space they find themselves in. Similar to a liquid, a gas also takes the shape of its container. Examples of gases could be air or helium. Can you think of any other gases?

Viscosity
Liquids flow because of gravity. Gravity pulls everything towards the earth. So if you spilt molasses on the wall, it would slowly slide down towards the earth. If you spilt water on the wall, it would slide down towards the earth as well, but it would slide much faster. How fast something flows is called its viscosity. Different items have different viscosities.

Viscosity tells us how fast or slowly a liquid will flow. You can even think of viscosity as how thick something is. The thicker it is (like molasses), the slower it will flow, meaning it has a higher viscosity. Have you ever heard of the expression “slow as molasses”? That comes from how slow molasses flow. If something is thinner (like water), then it will flow more quickly, meaning it has lower viscosity. You can even try testing this out if you have some molasses and water around the house.

Viscosity is an important part of today’s activity and is one of the reasons that oobleck is so cool and fun to play with.

OOBLECK

Oobleck
Some things can be more than one state of matter at once! Oobleck is an example of that. Oobleck can behave like both a liquid and a solid.

Oobleck is something called a non-Newtonian fluid. A non-Newtonian fluid is something that changes how easily it flows (or its viscosity) depending on the force or stress put onto it. When a non-Newtonian fluid does not have any stress on it, it flows and acts like a liquid. You can see that if you hold oobleck loosely in your hand, it will flow through your fingers like a liquid. In comparison, if you apply a strong force onto the oobleck like poking it quickly or squeezing it tightly, then it will act like a solid.

Once you have made your oobleck (see the instructions below), you can try testing this out. If you try squeezing the oobleck into a ball in the palm of your hand or pushing down really quickly onto oobleck in the bowl, what happens? What if you just hold some oobleck in the palm of your hand without applying any pressure? How does the oobleck react?

Another fun way to test this out is by poking the oobleck in the bowl really quickly with your finger. What do you feel? Is it different than if you very slowly sink your finger into the oobleck in the bowl?

Video Recommendations: Oobleck and Non-Newtonian Fluids: Crash Course Kids #46.1

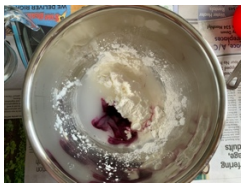
https://www.youtube.com/watch?v=Fnd-2jetT1w

Activity:

1. Measure out 1 ½ cups of cornstarch and add it to the bowl. Start with 1 ½ cups of cornstarch but you may need to add more later depending on the consistency.

2. Add 1 cup of water to the bowl.
3. If you want to have coloured oobleck, add a few drops of food colouring.

Note: just be aware that some food colouring can come off on your hands when you are playing with your oobleck, so be sure to wash your hand thoroughly after playing with your oobleck and your hand might have a tinge of that colour.



4. Mix the ingredients together using a spoon.

5. To test the consistency of your oobleck, you can try picking some up in your hand.

Remember, based on what you learned about non-Newtonian fluids, it should act like a solid if you apply force to it and should act like a liquid with no force applied to it. Try squeezing the oobleck in your hand, does it seem to form a ball in your hand? Try uncurling your fingers, does it flow between your fingers back into the bowl underneath your hand?

If your oobleck is too runny and doesn't form a ball when you squeeze it in your hand, add a little bit more cornstarch. If your oobleck is too thick and doesn't flow when you leave it sitting in the palm of your hand, add a little bit more water.

If you have been playing with your oobleck for a while and you notice it is starting to get thicker or to dry out, just add a little bit more water and mix it again. It should go back to the non-Newtonian fluid consistency.

6. If spill a little bit of oobleck, you can try leaving it to dry and then sweeping it up.
7. To store your oobleck to play with it again later, leave it in an open container to dry. When you want to use it again, just add some water back in and stir it.

What Did You Learn?

- What is chemistry and chemical engineering?
- What is matter and what are the three states of matter?
- What is viscosity?
- What are non-Newtonian fluids?

Future Learning

- What happens when you add more or less water? How does the oobleck change?
- What other non-Newtonian fluids exist? Do some research to see if you use any other non-Newtonian fluids in your life.

Share your creations!

We would love to see what you made. Email as at discover@uwo.ca or tag us on social media.

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Thanks for discovering with us!