

Western Engineering Outreach

Snow in July
Grade 3-5

Meet Today's ENG HERO!



Amarjeet Bassi - Professor with Western Engineering

Amarjeet Bassi is a professor with the Chemical and Biomedical Engineering Department at Western University. He has a PhD and a Professional Engineering degree! Dr. Bassi has over 150 scientific articles including peer reviewed journals papers, patents, books and refereed conference papers. Dr. Bassi has several research interests which include micro-algal applications for clean water and value recovery, integrated technologies for water refining and nutrient and energy recovery using biological systems.

To learn more about Dr. Ray visit:

https://www.eng.uwo.ca/chemical/faculty/ray_m/index.html

Learning Goal:

- Students will identify indicators of chemical change
- Students will discuss states of matter to learn about solids, liquids, and gases.
- Curriculum Connections: Grade 4 - Properties of and Changes in Matter

Materials Needed:

- Baking soda
- Water
- Vinegar
- Measuring cups: 1 cup, 1 Tbsp, 1 Tsp
- 2 plastic containers
- Dish soap
- Sticky note



Engineering and Science Connections:

Today, we will learn about the states of matter. Matter makes up everything in the world and it comes in three different states: solid, liquid, and gas. Matter can also undergo chemical and physical changes.

Solids:

Solids are usually hard because their molecules have been packed together very tightly. The closer the molecules are, the harder the substance. Solids can hold their own shape. For example, a rock will always look like a rock unless something happens to it. Since they like to hold their shape, the atoms in a solid do not move around very much.

Liquids

Liquids are an in-between state of matter. They do not have to be made up of the same materials; if you have a variety of materials in a liquid, it is called a solution. A very important characteristic of a liquid is that it will fill up the shape of a container. Liquids have their molecules fairly close together. They are not as close as solids, as they can move around a little.

Gas

Gas is everywhere. Gases are random groups of atoms. Unlike solids and liquids, the atoms in gases are full of energy and move around a lot. They are bouncing and moving around constantly.

Physical vs Chemical Change

There are two different types of changes that can occur in materials/substances. A physical change can be reversed easily, like freezing water to make ice cubes. You can very easily change the ice back into water. Chemical changes are a bit more complicated.

A chemical reaction occurs when two or more substances are combined to form a new substance. The original substances that are mixed are called reactants, while the substances produced are called products. Sometimes chemical reactions can be observed by noticing a new product being produced (maybe a solid, liquid or gas), a colour change, a new smell, or the release of heat. Baking a cake is an example of a chemical reaction that is easy to understand. The ingredients of the cake are the reactants (eggs, flour, sugar, etc.), and the heat of the oven causes a chemical reaction to occur, and a new product is produced (a cake).

There are some different indicators of a chemical change:

- a. Light being given off (e.g. Combustion)
- b. Temperature change
- c. Production of gas
- d. Change in colour
- e. Forms a precipitate (a solid separated from a solution)

Video Recommendations: *The States of Matter*

<https://www.youtube.com/watch?v=JQ4WduVp9k4>

A Day in The Life of Snowmaking

<https://www.youtube.com/watch?v=O3kDkJcv3XM>

Activity:

Before beginning, think about the following questions:

- What are the three states of matter?
- What is a chemical change?
- What is a physical change?
- What are some indicators of a chemical change?

Making Snow!

1. Write "Soap" on a sticky note and stick it to one of the containers.
2. Scoop one cup of baking soda into the container without the sticky note. Add three tablespoons of water and mix the ingredients together to make a dough. It should feel like modeling clay. You can add water in small amounts at a time if the dough is too crumbly, until you reach the right consistency.
3. Have fun molding a snowman, a polar bear, or any other critter. Feel free to decorate your creation with waterproof objects. Keep your creation in that container.
4. Now, take the container with the sticky note reading "Soap," and make a second batch of dough using a slightly altered recipe. Add one cup of baking soda and one teaspoon of dishwashing soap to the container, followed by three tablespoons of water. Mix the ingredients together to make a dough. You can add water in small amounts at a time until the dough molds well.
5. Have fun molding a second critter; it could be very similar or quite different from your first creation but try to make something of similar height and size. Feel free to decorate this creation with waterproof items. Keep your creation in that container.
6. Admire your creations. In the next step, you will melt them by pouring vinegar over your creations (but do not do it yet)!
7. Fill your measuring cup with vinegar and pour all of it at once over your first creation.
8. Fill your measuring cup again with vinegar and pour all the vinegar at once over the other creation.
9. Most likely, your critter is partly destroyed and only partially standing. Try something different this time; find out what happens when you pour water over your critters.
10. Rinse your measuring cup and fill it with water. Pour all of it at once over whatever is left of your first creation.
11. Fill the measuring cup again with water. In a minute, you will pour it over what is left of your second creation.

Debrief

Did both creations fizz as soon as vinegar touched them? When vinegar comes in contact with baking soda, they react with each other. The result is a gas bubbling up in a watery solution. The bubbles create the fizz and sizzling sound. After pouring vinegar on your creation (without the soap) there was probably very little left and it was probably standing in a pool of a bubbling watery solution, where bubbles burst open as they reached the liquid surface. This was probably different for your other container. The leftovers of the second creation (with dishwashing soap) were probably surrounded by a layer of white foam. Chemicals in detergent allow soapy solutions to spread out. The bubbles created in the chemical reaction still rose to the surface, but now, the soapy solution trapped the bubbles, forming a foam.

As water does not react with baking soda, pouring water over your creations probably just washed away some dough without any sizzling, fizzing, or foaming.

What Did You Learn?



- What are the three states of matter?
- What are the differences between a chemical and physical change?
- How particles move in different states of matter

Future Learning



- Turn this activity into an experiment! Try and pour different liquids onto your critters! Try and pour different amounts of already used liquids onto them! Try and use different proportions of chemicals to create with. Try and see if you can create it with different materials. Have fun and send us photos of what you've created and of you dissolving your creatures!

Share your creations!

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

Instagram: @westernueng

Twitter: @westernueng

Facebook: @westernueng

Thanks for discovering with us!