LET'S MAKE MILK PLASTIC

Project Guide [Milk Plastic Instructions]

MATERIALS PER STUDENT:

Ziploc bags

Milk, 1 cup

White vinegar, 4 teaspoons

Measuring cup

Measuring spoons

Mug or heat resistant cup large enough to hold at least 1 cup

Paper Towels

Spoon

Table Covers

Stovetop Oven and pan/pot OR Microwave and Microwave-safe dish

SET YOUR PARAMETERS.

Allow students to be as creative as they desire!! Some items that can be used to help the creative juices flow are listed below, but the opportunities are endless!!

Glitter

Cookie cutters

Food coloring

Markers

Paint

INSTRUCTIONS.

1. Heat milk until milk is steaming. It should be the same temperature as you would want milk to be if making hot cocoa.
2. Add 4 teaspoons of white vinegar to mug.
3. Add 1 cup of milk to mug.
    - Questions
        - What happens when you add the milk to the vinegar? Does anyone know why this happens? Do you know what the curds are made of?
            - Milk contains a protein called 'casein' that clumps together when you add an acid, like vinegar or lemon juice.
                - Do you know what the leftover liquid is called? It's whey!!
4. Mix the contents in the mug slowly for a few seconds(6 seconds to be safe).
    - What happens when the milk and vinegar are mixed together? Why do you think this happens?
5. Stack 4 layers of paper towels.
6. Once the mixture has cooled, use a spoon to scoop out the curds unto the paper towels while leaving as much whey in the cup as possible.
7. Fold the edges of the paper towels over the curds and press down to absorb excess liquid from the curds.
8. Knead the curds into a ball of dough. This is the casein plastic!!

    - How does the dough ball look and feel compared to the how they looked originally?
9. If you wish to change the entire color of your dough, incorporate food coloring or glitter into your dough now.
10. Let's get creative!! To shape, mold, or cut your dough, be sure it has been kneaded very well.
    - You can color, shape, or mold it **within an hour of making the dough.**
    - Dried casein plastic can be painted or colored with markers.

FUN FACTS:

1. Casein was used by Ancient Egyptians as a fixative(preservative) for paintings in wall paintings.
2. The early form of casein plastic was very durable and could handle washing, ironing, and dry-cleaning solvent, making it popular to use for buttons, knitting needles, hair combs, and artificial ivory horns.
3. Modern plastic replaced casein plastic due to casein having to be immersed in formalin, a formaldehyde solution, to harden- a process which can take up to 1 year depending on the thickness.
