Undressing the Egg!

Simple Supplies:

- 5 Eggs
- 4 Clear Glasses
- Vinegar
- Liquid Watercolor
- Distilled Water
- Karo Syrup
- Notebook Paper
- Pencil
- Masking Tape

*Tip – This project will take up to six days to complete.

How To:

1. Have your child touch and observe five eggs. Ask them:
    a. What it feels like?
    b. What do they look like?
    c. Are they heavy?

2. Have your child(ren) create a column for each egg on their notebook paper and label the columns 1-5. Then have them write down their observations for each egg in their columns leaving plenty of room for future observations.

3. Label the four glasses with masking tape with a 1, 2, 3, and 4. Then carefully lower one egg into each of the four glasses.

4. Fill three glasses with vinegar and one with distilled water. There should be just enough liquid to cover the eggs. Now add a drop or two of liquid food coloring into each glass. You can use different colors for each glass if you like.

5. Have your child(ren) briefly write down what they think will happen to each egg with the food coloring and the liquids in each of their columns. Ask them:

    a. What is happening?
    b. Is the same thing happening in all the glasses?
    c. What do they smell like?

6. Leave the glasses with their eggs out on the kitchen counter and place the fifth egg in the refrigerator for three days. Have your child(ren) write down their observations for each day. Your child(ren) can gently touch and observe all five eggs each day. Be careful not to pop them.

7. On the third day, carefully pour off the liquid from the glasses, and gently rinse the eggs. Have your child(ren) gently touch and observe all five eggs, writing down their observations before you return the eggs to their glasses and refrigerator. Ask them:

    a. How have they changed?
    b. Are they the same?

8. Next, pour Karo syrup over one vinegar treated egg and over the distilled water eggs. Then allow your child to pick two other liquids to pour over the two remaining vinegar treated eggs. They can pick soda, punch, or a juice for example. Have them note their choices and write down what they think will happen to each egg.

9. After three more days of observations, pour off the liquid and carefully rinse the eggs again. Encourage your child to softly touch, explore, and compare all of the eggs, including the one from the refrigerator. After taking some time to study the eggs, encourage them to pop the eggs with their fingers and get a little messy! Ask them:

    a. What do you notice?
    b. What do the eggs look like?
    c. What do they smell like?
    d. What do they feel like?
    e. How have the eggs changed?

f. Have they all changed in the same way?
g. How do they compare to the egg that was kept in the refrigerator?
h. Why do you think eggs have shells?

What Happened:

The acidic vinegar dissolved the calcium-based hard egg shell leaving the egg's *membrane* that separates the shell from the egg we cook and eat. Unlike the hard shell, the membrane layer is semi-permeable and allows water to pass through. When molecules move through a membrane, they tend to distribute in a way that equals out the concentration of those molecules on each side of the membrane wall. This is called *osmosis*.

When the egg was placed in the Karo syrup, the *osmotic pressure* creates a *hypertonic* solution with a higher concentration of molecules outside of the egg, the water inside the egg distributes out of the egg and into the Karo syrup. That makes the egg shrink. The food coloring should pass out of the egg to create a layer of color in the syrup. However, this color layer is missing for the egg in the distilled water. Because distilled water is nothing but water, the osmotic pressure crates a *hypotonic* solution with lower concentration of molecules outside of the egg, the egg should swell as the water distributes into the egg.

Vocabulary:

- *Osmosis* – a process by which molecules of a solvent tend to pass through a semipermeable membrane from a less concentrated solution into a more concentrated one, thus equalizing the concentrations on each side of the membrane.

- *Osmotic Pressure* – the pressure that would have to be applied to a pure solvent to prevent it from passing into a given solution by osmosis, often used to express the concentration of the solution.

- *Hypertonic* – having a higher osmotic pressure than a particular fluid, typically a body fluid or intracellular fluid.

- *Hypotonic* – having a lower osmotic pressure than a particular fluid, typically a body fluid or intracellular fluid.

- *Membrane* – a thin sheet of tissue or layer of cells acting as a boundary, lining, or partition in an organism. This microscopic double layer of lipids and proteins that bounds cells and organelles and forms structures within cells.