Modeling Ionic Interactions: Student Handout Day 1

Throughout this lesson you will be working cooperatively with a small group of 2-3 students. You will be engaged in a process of model creation and revision throughout the activity to explain what you see happening in the teacher demonstration.

**Engage:**

Discuss these two questions with your partner and write some of your ideas on the top of the large post-it paper at your table. Use only the top portion of your large paper!

1. What are models and how do scientists use them?
2. What are some characteristics of “high quality” models?

Initial Conjectural Model:

1. After observing the teacher demonstration (Poly Density Bottle® or video alternative), use the bottom of the large post-it paper to create your own initial model explaining what you observed happening in the bottle and why. Draw a model depicting the three time periods—initial mixture, during separation of the beads, final placement.
   1. Your model should include observations that support your explanations. Include both words and drawings (macro and particulate level if possible)
2. Share you models: A key purpose of scientific models is that they provide a quick, easy way to communicate thinking. Let’s see if we can push our own thinking about the bottle phenomena by learning about the thinking and reasoning of our peers.
   1. Be prepared to review/critique the ideas presented by other groups.

**Explore**

Physical Model (Structured and Guided Inquiry options)

Safety: Put on goggles, apron, and gloves. Isopropyl Alcohol is flammable, avoid heat, open flames or sparks while using this chemical.

Materials: (Need one for each group of 2-3 students)

.25 L bottle of water (remove store label)

Table salt (NaCl) (~ 50 grams)

70% isopropyl alcohol (~.125L)

One drop food coloring (green)

One sheet Large post-it Easel Pad or Newsprint for student posters

Markers

Balance (for inquiry option)

Graduated Cylinder (for inquiry option)

Beads of various sizes and densities (for inquiry option)

Sugar (for inquiry option)

**Structured Option**

1. Design a similar system using the teacher provided materials (the same ones that are in the bottle): salt, water, isopropyl alcohol, and green food coloring (instead of beads)
2. With label removed from a 0.25L water bottle, pour out half (.125 L) of the water in the bottle.
3. Add about .125 L isopropyl alcohol to the bottle. Make sure you leave at least 2 cm of air at the top of the bottle.
4. Add one drop of green food coloring to the bottle. Replace cap and lightly shake bottle.
5. Add salt and replace bottle cap and shake mixture. Continue adding salt until you observe a separation of two colored liquids (about 50 grams).

**Inquiry Option**

Inquiry Challenge:

Design your own physical model using the teacher provided materials. You must develop a step-by-step procedure list and get approval from your teacher before mixing any chemicals. Provide a rationale for the materials you choose.

If your teacher has provided various beads, you could determine the density of the beads needed to replicate the demonstration. Alternatively, you can add one drop of food coloring to help you better observe the various liquids in your bottle.

**Questions**

1. Did the alcohol and water mix with each other? How do you know?

2. How did the addition of salt (or sugar) change your model?

**Model Revision and Explanation**

1. Based on your new information and the behavior of your small bottle—revise your initial model. Using different colored sticky notes to change at least 1 thing in the following categories: ADD new explanations (yellow sticky note), REVISE previous content in your model (blue sticky note), and Write any QUESTIONS you still have (purple sticky note)
2. Individually write a Claim, Evidence, Reasoning explanation (CER).