Using Phenomena in the High School Classroom

Presenters
Courtney Garner - cgarner@aj81.net
Chelsea Kaericher - ckaericher@rccu1.net

Thank you for joining us today in our Breakout Session. We know how difficult simply teaching chemistry to high school students can be. The curriculum behind NGSS asks us, as teachers, to present the same content, but in a way that is challenging to both the teacher and the students. Today, we will present several methods for introducing “Phenomena” into your classroom. If you have any further questions about materials, presentation, content, etc. please do not hesitate to reach us at the email addresses listed above!

High School Phenomena

1. Reaction of Group 1 Metals
   - YouTube Clip - Reaction (Explosion) of Alkali Metals with Water
   - NGSS Standards:
     - HS-PS1-1: Use the periodic table as a model to predict the relative properties of elements based on the pattern of electrons in the outermost energy level of atoms.
     - HS-PS1-2: Construct and revise an explanation of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

2. Why do some substances change into new substances, but others only change phase?
   - YouTube Clip - Funny Elephant Toothpaste (Chemical Reaction)
   - NGSS Standards:
     - HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
     - Surface Tension - Demo Water vs. Hydrogen Peroxide on a penny, water bugs, water beads on a windshield. Discuss the bonding of water with hydrogen bonding.
3. Peeps and the Speed of Light
   - YouTube Clip - Finding the Speed of Light With Peeps
   - Banana Chips and Colorful Campfires
   - NGSS Standards:
     - **HS-PS4-1**: Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

4. Chicken Liver Enzyme Reaction
   - HS-PS1-5 Matter and its Interactions: Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
     - Enzymes/Catalysts
     - Evidence of Reaction
     - Reaction Rates

5. Speed and Velocity
   - **Texting and Driving**
     - Students design and experiment to determine the time it takes to send a text. Then use Google Maps to relate the distance traveled to familiar locations.

6. Density Columns
   - Baked Alaska
   - How do hot air balloons work?
   - Density columns
   - Coke vs Diet Coke in a fish tank demo
   - Hot and cold water flip prediction

6. Gas Laws
   - How do hot air balloons work?
   - YouTube clip - Railroad tank car vacuum implosion
   - Gay-Lussac’s Law--Pressure Can Crusher
- Charles’ Law--Egg in a Bottle
- YouTube clip - Eco-Cooler | Grey Dhaka unveils world’s first zero-electricity air cooler made from plastic bottles
- Fermentation Gone Wrong
- Mini bell jars with marshmallows

7. Formation of a precipitate

- Soda and milk

8. Why do hydrangeas come in different colors?

- pH
- Indicators
- Cabbage juice indicator

9. How will I ever use this (Stoichiometry) again!?

- YouTube Clip--The Chemistry of Cookies--Stephanie Warren
- NGSS Standards:
  - **HS-PS1-7**: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

- Cookie Stoichiometry
  - Stoichiometry
  - Molar Ratios
  - Percent Yield
  - Limiting Reactants

**Useful Websites**

- Nextgenstoryline.org
- Phet.com
- [http://sciencecases.lib.buffalo.edu/cs/](http://sciencecases.lib.buffalo.edu/cs/)
- [http://concord.org/ngss/](http://concord.org/ngss/)
- http://www.ngssphenomena.com/
- Veritasium on YouTube
- Ck12.org/ngss
- Hog hilton - For electron configurations
- Pogil.org
  https://pogil.org/resources/curriculum-materials/high-school-chemistry-activities
- http://ambitiousscienceteaching.org/

Other Ideas: