Activity: Sustainability

FOR THE TEACHER

Summary
In this activity, students are introduced to the idea of sustainability by building a vocabulary that they will use and develop through the unit. The subsequent unit focuses on water sustainability, specifically. Read more about this unit in the May 2015 issue of Chemistry Solutions.

Grade Level
High and middle school

Objectives
By the end of this lesson, students should be able to
- Define the term sustainability in their own words.
- Understand that sustainability is complex but it is important to be aware of the potential issues.
- Know the 3 Es of sustainability (environment, economy, social equity).

Chemistry Topics
This lesson supports students’ understanding of
- Sustainability

Time
Teacher Preparation: 15 minutes
Lesson: 50 minutes

Materials
- Area for students to share ideas
- Supporting videos. There are many possibilities here, anything locally or globally relevant to exemplify sustainability issues for your students. Here are some of the videos that I have used:
  - The O Ambassadors and The Elerai River Video – Oprah show clip (2:52)
  - The Global Water Crisis – Bytesize Science (8:16)
  - The Gift of Clean Water — Uncultured Project (4:00)
  - Cow Sh*t To Clean Water — Uncultured Project (3:47)
  - Water As A Resource — TWIG Video (must be a member to view)
  - Water Supply — Brain Pop (must be a member to view)
- Supporting images and infographics (resources from Facing the Future have been useful)

Safety
No specific safety considerations need to be observed for this lesson.

Teacher Notes
- The 3 Es are: Environment, Economy, and Social Equity
Using a prompt as journal/do now/turn and talk exercise can be a useful way to generate ideas. The accompanying PowerPoint provides additional information that introduces ideas behind sustainability.

**FOR THE STUDENT**

**Lesson**

1. Give students this prompt as a journal/do now/turn and talk exercise:
   Think about a better future for the people in our community, city, country, and planet.
   - What do you want the world to be like 50 or 100 years from now?
   - How do you want people to be living and treating each other 50 or 100 years from now?
   - **What do you want to last beyond your lifetime?** It could be objects, beliefs, different natural resources, social or political ideas, services, organizations, etc.

2. Once students have had enough time to reflect independently and/or discuss their responses with a neighbor, have students share their answers. The teacher should populate a three-column chart, purposefully grouping the responses according to the “3 Es” (but don’t tell students what the column headers are). For example, a student might respond they want clean air or renewable energy, so those things might end up in the first (unlabeled) column for “Environment.” Someone might say better education or more people participating in government through voting. These ideas would be written in the “Social Equity” column. To develop critical thinking skills, be transparent about sorting students’ responses and ask them to actively analyze and search for the grouping method. In other words, have students analyze the sorting of responses for patterns and similarities to determine the column headers. Students also have a three column chart, and they should place the shared responses in the same column as the teacher.

3. Once student discussion is headed in the right direction, and the three-column chart is well populated, have the students offer what they think the headers are and then confirm them by labeling the columns as Environment, Economy, and Social Equity. With dynamic and well-timed teacher leading, I have found that students essentially arrive at or close to the column headers on their own.

4. Lead students through the PowerPoint on sustainability, which is interlaced with inspiring video clips, data tables, charts, diagrams, and infographics that inspire interest and a foundation for the remainder of the unit. During the PowerPoint, students are asked to “tell the story” of several graphs. During the class discussion we analyze a series of graphs that show population growth, countries where population growth is most increasing, and compare the ecological footprint of various countries.

5. Finish by funneling and focusing the broad introduction of sustainability down to specifically water sustainability and water chemistry. Here I usually preview some of the labs, guest instructors, engineering topics, and the eventual PSA project, which gets students excited and a sense of how this nonchemistry is connected.

6. Select a set of questions that asks students to demonstrate their knowledge of what sustainability is, how it can be understood through the 3 Es, and reflection questions that get at the big picture question of “why should we care” as a first homework or classwork assignment. Generally, I ask questions that have students reference information from the PowerPoint.

**CONNECTIONS TO STANDARDS**
Common Core
Reading  5, 7, 8
Speaking and Listening  1, 2, 3

Next Generation Science Standards
Disciplinary Core Ideas
Earth science
ESS3A - Natural Resources
ESS3C - Human Impacts on Earth Systems
ESS3D - Global Climate Change

Engineering design
ETS1A - Defining & Delimiting an Engineering Problem
ETS2A - Interdependence of Science, Engineering & Technology
ETS2B - Influence of Science, Engineering & Technology on Society & the Natural World