Utilizing the Best of ChemMatters to Increase Engagement in Class

Brianna Clark, Denver, CO
&
Rebecca Stober, Denver, CO
Why do we use it?

• **Ties to district-mandated curriculum**
  – Increase literacy in science
  – Connections to everyday life
  – Opportunities for extension for students

• **Connects to multiple science concepts**
  – Supports student connections beyond chemistry
Why do we use it?
Why do we use it?

- Provides opportunity for connections to NOS & NGSS Standards
  - Not adopted by all states
  - Aligns with best practices for science pedagogy
Planning Lessons

• Provides objectives, assessment options, estimated time, materials lists, & safety

• Lessons laid out with 5-E model
  – Engage, Explore, Explain, Elaborate, Evaluate
1. **Engage**: Discuss bioplastics & use provided questions to gauge current thinking
2. **Explore**: Anticipation Guide before & during reading article
3. **Explain**: Answer Reading Guide to summarize thinking
4. **Elaborate**: Explain/describe advantages/disadvantages of bioplastics
5. **Evaluate**: Presentation OR debate
6. **(Extend)**: Activity from article (making compostable bioplastic)
During the Lesson

• **Student Preconceptions:**
  – Prepares for potential student questions
  – Helps guide students to alter ideas

• **Reading Guide:**
  – Anticipation Guides & Reading Guides
  – Possible student answers

• **Multiple Activities:**
  – Options for activities & rubrics for assessment
POSSIBLE STUDENT PRECONCEPTIONS

These preconceptions may be discussed as students read the article or after (not before).

1. **Plastics are synthetic petroleum-based products.** The term “plastics” means any moldable solid materials, whether they are made from natural or synthetic materials or a combination of the two.

2. **All polymers are plastics.** Several major categories of polymers exist, only one of which is plastics. Other major categories include coatings (e.g., paints and varnishes), adhesives (e.g., glues), elastomers (e.g., stretchable materials such as rubber bands and tires), and fibers (e.g., polyester and nylon). There are other categories, too: sealants and caulks, films and sheeting, composites and laminates, and conductive polymers. Plastics seem to get all the hype, but the other polymer categories are equally important in our daily lives.

3. **Products labeled as “bioplastics” are made solely of things we grow.** Many plastics labeled as bioplastics also contain plastics made from crude oil. Blends are sometimes advertised as bioplastics even though they contain plastics that are petroleum-based.

4. **The recycling of bioplastics will solve the environmental problems resulting from the disposal of bioplastics.** Recycling is presently not an option because of the small volume of bioplastics being used and recycled and because bioplastics at present are not clearly labeled as bioplastics.
NAME: ____________________________

Reading Guide for “Plastics Go Green”

- As you read the article, in the graphic organizer below, compare the bioplastics polylactic acid (PLA) and polyhydroxyalkanoate (PHA).

<table>
<thead>
<tr>
<th></th>
<th>PLA</th>
<th>PHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production Steps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advantages</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
During the Lesson

Activity: Make Your Own Compostable Bioplastic

This activity is intended for high school students under the direct supervision of an adult. During the activity, students must wear safety goggles.

With just a few materials that are easily available, you can make your own sample of corn-based plastic. Your sample will share the same corn base as manufactured bioplastics, but the product of this quick-and-easy process will be much softer. Weak bonds cause the sample to dissolve quickly in water, something manufacturers hope does not happen to their bioplastic products.

Here is how to make corn-based plastic:

Materials
1 tablespoon cornstarch
2 drops corn oil
Zip-sealing plastic bag
1 tablespoon water
Food coloring
Microwave oven

What to do
Place the cornstarch in the plastic bag.
Add corn oil. Add water. Seal the bag, and microwave for 5-10 minutes.

Rub the polymer with your fingers. Add a drop of food coloring to the mixture.
Assessment Tools

• Evaluation Options
  – Included for each article
  – Multiple options

• Suggested Rubrics
  – One for each evaluation option
  – Provided for extension activities

• Potential Student Answers Provided
  – Anticipation/Reading Guides
<table>
<thead>
<tr>
<th>SCORE</th>
<th>DESCRIPTION</th>
<th>EVIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Excellent</td>
<td>Complete; clearly details key chemical concepts involved; includes examples from the article as well as outside research; includes references; demonstrates deep understanding; engaging and appropriate for audience.</td>
</tr>
<tr>
<td>3</td>
<td>Good</td>
<td>Complete, but lacks details of chemical concepts involved; includes some examples and references; demonstrates some understanding; lacks engagement and appropriateness for topic audience.</td>
</tr>
<tr>
<td>2</td>
<td>Fair</td>
<td>Incomplete; few details describing of chemical concepts involved; no examples from the article; some misconceptions evident; not engaging or appropriate.</td>
</tr>
<tr>
<td>1</td>
<td>Poor</td>
<td>Very incomplete; no details provided about of chemical concepts involved; no examples from the article; many misconceptions evident; not engaging or appropriate.</td>
</tr>
<tr>
<td>0</td>
<td>Not acceptable</td>
<td>So incomplete that no judgment can be made about student understanding.</td>
</tr>
</tbody>
</table>
Areas for Differentiation

• Extensions for Advanced Students
  – Diverse projects: hands-on activities & research suggestions

• Project Based Learning
  – Project Assessments

• Related Resources
  – Additional connections & resources for each lesson
Questions?
Survey, Certificate, and Downloads

To complete a brief survey about this webinar, and to generate your certificate of attendance, visit:

To Download Resources: