



# GREEN-EDU Learning Activity

Title: Greening our everyday products

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## Summary

### Lesson plan summary

Through this lesson plan students will learn about green Chemistry and explore ways that everyday products they use become greener. Students will learn to read product labels and understand processes for making everyday products such as soap and toothpaste.

Subject	Green Chemistry
Topic	Greening everyday products
Age of students	Elementary 6-12
Preparation time	30 Minutes
Teaching time	180 Minutes
Online teaching material (links for online material)	<i>Introducing Green Chemistry: The Science of Solutions</i> <a href="https://blossoms.mit.edu/videos/lessons/introducing_green_chemistry_science_solutions">https://blossoms.mit.edu/videos/lessons/introducing_green_chemistry_science_solutions</a>
Offline teaching material	<ul style="list-style-type: none"> <li>▪ "12 Principles of Green Chemistry" from Figure 4.1: (p.30). 12 Principles of Green Chemistry from <i>Green Chemistry: Theory and Practice</i> (1998) by Anastas P and Warner J. By Permission of <a href="#">Oxford University Press</a>.</li> <li>▪ <a href="#">American Chemical Society Green Chemistry Institute</a></li> <li>▪ <a href="#">EPA Green Chemistry</a></li> <li>▪ <a href="#">Beyond Benign</a></li> <li>▪ <a href="https://www.youtube.com/watch?v=PqxMzKL_YrZ4">https://www.youtube.com/watch?v=PqxMzKL_YrZ4</a></li> <li>▪ <a href="https://www.youtube.com/watch?v=RzkJkEKV8Yk">https://www.youtube.com/watch?v=RzkJkEKV8Yk</a></li> <li>▪ <a href="https://www.youtube.com/watch?v=IDhapt7nw4A">https://www.youtube.com/watch?v=IDhapt7nw4A</a></li> </ul>

## Aim of the lesson

By the end of this lesson students will:

- 1) Understand the importance of Green Chemistry



- 2) Learn about chemistry in everyday life
- 3) Use the design cycle to make soap and toothpaste
- 4) Use green chemistry principles to make production of soap and toothpaste greener

## Trends

STE(A)M Learning , Collaborative Learning, Problem solving



## Activities

Name of activity	Procedure	Time
Chemistry in everyday products	<ol style="list-style-type: none"> <li>1. Start the lesson with <b>introductory questions</b>: What does a chemist do? What are some chemical products? Have you ever wondered why chemistry is so important? Why do we study chemistry? What is the role of chemistry in life?</li> <li>2. Ask students to brainstorm ideas about household products that they could make. Make a chart or use post its to gather all ideas. <a href="https://jameskennedyonash.files.wordpress.com/2013/12/household-chemistry1.jpg">https://jameskennedyonash.files.wordpress.com/2013/12/household-chemistry1.jpg</a></li> </ol>	20 min
Introduction to Green Chemistry	<ol style="list-style-type: none"> <li>1. Start a discussion with questions such as What do you think about when you hear the words "Green Chemistry"? What is environmental science?</li> <li>2. Students can watch the introductory video ...</li> <li>3. Students will be introduced to the 12 Principles of Green Chemistry.</li> <li>4. Activity: Think about what Green Chemistry means to you.</li> <li>5. Present the 12 principles in your own words.</li> <li>6. Students will be divided in groups. Each group will be assigned with a green Chemistry principle and will be asked to present it with a skit, a drawing or even a song to their classmates.</li> </ol>	25min
<b>Lab Activity : Ask students to design their own household product following the design cycle.</b> <b>Students should write their recipe and test the safety and efficacy of their product . Alternatively for younger students , students could follow the protocol for making soap , toothpaste or any other household product.</b>		
Make antiseptic protocol	<p>Protocol for Hand sanitizer, according to WHO:</p> <p>Materials Q</p> <p>Ethanol 96% or isopropyl alcohol 99.8%: 8333 ml or 2.2 gallons of ethanol or 7515 ml or 2 gallons of isopropyl alcohol</p> <p>Hydrogen peroxide 3%, which is used to inactivate contaminating bacterial spores in the solution and is not an active substance for hand antisepsis: 417 ml or 1.76 cups</p> <p>Glycerol 98%, which acts as a moisturizer: 145 ml or 0.6 cups</p> <p>Sterile distilled or boiled cold water</p> <p>Depending on how much you want to make, you'll need anywhere from a 10-liter (2.6 gallon) glass or plastic bottle to 50-liter (13.2 gallon) plastic tank.</p> <p>Wooden, plastic or metal paddles for mixing</p> <p>Measuring cylinders and measuring jugs</p> <p>Plastic or metal funnel</p>	90min



	<p>An alcoholometer The recipe provided by the organization can be prepared in 10-liter glass or plastic bottles with screw-threaded stoppers to prevent spillage.</p> <p><b>Step by step preparation, according to WHO:</b></p> <p>The alcohol for the formula to be used is poured into the large bottle or tank up to the graduated mark. Hydrogen peroxide is added using the measuring cylinder. Glycerol is added using a measuring cylinder. As glycerol is very viscous and sticks to the wall of the measuring cylinder, it should be rinsed with some sterile distilled or cold boiled water and then emptied into the bottle/tank. The bottle/tank is then topped up to the 10-liter mark with sterile distilled or cold boiled water. The lid or the screw cap is placed on the tank/bottle as soon as possible after preparation, in order to prevent evaporation. The solution is mixed by shaking gently where appropriate or by using a paddle. Place the solution in quarantine for 72 hours before use. This allows time for any spores present in the alcohol or the new/re-used bottles to be destroyed.</p>	
<p><b>Make toothpaste protocole</b></p>	<p><b>Baking soda toothpaste</b></p> <p>Baking soda is an ingredient often found in toothpastes. According to the Journal of the American Dental Association, baking soda:</p> <ul style="list-style-type: none"> <li>is safe</li> <li>kills germs</li> <li>is a gentle abrasive</li> <li>works well with fluoride (in commercial toothpastes)</li> </ul> <p>Mix 1 tsp. of baking soda with a small amount of water (you can add water based on the texture you prefer).</p> <p>You may want to consider adding a flavoring to your toothpaste by using an essential oil (such as peppermint), but more research is needed Trusted Source to support the use of essential oils for treatment of dental conditions.</p> <p>Don't swallow baking soda or essential oils.</p>	<p>90 min</p>
<p><b>How can we make our soap or toothpaste greener ?</b></p>	<p>Students reflect on the Green chemistry principles. They revise their product protocole and think of how green their product is. They propose ways to make the product greener and present their ideas in an infographic.</p>	<p>45 min</p>



## Assessment

*Describe here the assessment method of the lesson, if any. For example, if you plan on assessing your students with a quiz, include here questions and answer options with color-coding the correct answers.*

Assessment could be as a rubric for the lab and the infographic or a multiple choice quiz checking students understanding of the processes and principles .