 

**ELEMENTARY SCHOOL**

**Sustainable Science**

**Desalination Design Challenge**

**Lesson 3: Focus on Filtering**

**Teacher Background and Overview:**

As discussed in Lesson 1, there is a limited supply of fresh water available to meet the demands of life on Earth. Unfortunately, accessible water is not always safe for the animals, plants, and other types of life that rely on fresh water. According to the World Health Organization, waterborne diseases are one of the top ten causes of death in the world; most of these diseases are from water polluted by household sewage. Although the accessibility of clean drinking water is an ongoing challenge, there is hope: water filtration and clean water solutions are greatly improving public health around the world. In 2015, these diseases resulted in just half of the deaths that they caused in 2000. As sustainable, inexpensive water filtration technology continues to improve and become more accessible, the number of people affected by waterborne illness will continue to decrease.

In this lesson, students will review different types of filters that are used around the world. They will then design a water filter that they’ll build and test with muddy water, using the information on biomimicry and sustainability from Lesson 2. Students will wrap up the lesson by working with their partner to compare sketches and create one final design proposal that uses the best ideas from each partner’s drawing.

**Additional Resources:**

*The Top 10 Causes of Death: Fact Sheet*

<http://www.who.int/mediacentre/factsheets/fs310/en/>

*Drinking-Water*

<http://www.who.int/mediacentre/factsheets/fs391/en/>

*WHO: Waterborne Disease is World’s Leading Killer (2009)*

<https://www.voanews.com/a/a-13-2005-03-17-voa34-67381152/274768.html>

*Hands-on Activity: Water Filtration* <https://www.teachengineering.org/activities/view/water_filtration>

*6 Water-purifying Devices for Clean Drinking Water in the Developing World* <https://inhabitat.com/6-water-purifying-devices-for-clean-drinking-water-in-the-developing-world/>

**Time Required:**

30 minutes

**Learning Objectives:** Students will…

* Understand how filtration works.
* Design a water filter.
* Revise their water filter design based on feedback.

**Standards:**

***NGSS***

**5-ESS3-1**Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

**3-5-ETS1-1** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

***Massachusetts Standards***

*STE*

**5-ESS3-1** Obtain and combine information about ways communities reduce human impact on the Earth’s resources and environment by changing an agricultural, industrial, or community practice or process.

**5-ESS3-2(MA)** Test a simple system designed to filter particulates out of water and propose one change to the design to improve it.

**5.3-5-ETS3-1(MA)** Use informational text to provide examples of improvements to existing technologies (innovations) and the development of new technologies (inventions). Recognize that technology is any modification of the natural or designed world done to fulfill human needs or wants.

*ELA & Literacy*

**SL.5.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly.

**Materials:**

* *6 Water-purifying Devices for Clean Drinking Water in the Developing World* <https://inhabitat.com/6-water-purifying-devices-for-clean-drinking-water-in-the-developing-world/> (shown using a projector screen)
* Wrap-Up notes from Lesson 2
* Drawing supplies (optional)

**Teacher Preparation:**

* Review article to share with your class. If you wish, you can put pictures into a PowerPoint presentation instead of sharing the article.
* Create a PowerPoint slide with your own supplies list to share with the class.

**Keys to Success:**

* The article includes a variety of different water filtration devices. You do not need to show all the slides to your students; for the sake of time, you will want to choose ahead of time which slides will be most relevant to your class.
* Lesson 3 provides a list of suggested materials. However, you are encouraged to use supplies that are readily available in your classroom.
* To save materials in Lesson 4, students may work in groups of three instead of working in pairs.

**Extension Options:**

* This lesson can be extended to teach MA STE 5-ESS3-1 by incorporating reading material on both historic and new water filtration methods.

**Procedure:**

1. Review with your class why it is important to find clean freshwater solutions.
2. Remind your class that water filters are used to remove unwanted contaminants from water.
3. Show the *6 Water-purifying Devices for Clean Drinking Water in the Developing World* article with the class on a projector to highlight different types of water filters.
4. Explain to the class that they will be designing, building, and testing their own water filters using readily available materials.
5. Remind the class of their recent discussion about sustainability in Lesson 2 and ask them to share a few ideas about what would make a water filter sustainable.
6. Have students pull out their Wrap-Up notes from Lesson 2, in which they captured their ideas for how nature can inspire them to design a water filter.
7. Invite students to share their ideas on how nature can help us solve our problem of a limited supply and access to fresh water, using their notes from the Lesson 2 reading.
8. Share the Materials List PowerPoint slide. Instruct students to use what they know about filters, sustainability, and how nature conserves water to create a design for a water filter that they could build using the supplies available to them. Provide students about 10 minutes to draw their filters.
9. Ask students to compare and contrast their filter designs with their partners. Have each pair consolidate their designs into one new design, pulling the best ideas from both of their drawings.

**Wrap-Up/Assessment:**

1. Have students store their design sketches in a safe place for use in Lesson 4, or collect the sketches to pass out again in the next class.