Women in STEAM - Rising to the Challenges of the Global Water Crisis

Featured Bio:

Lalita Prasida

Bio Narrative:
Lalita is the winner of the 2015 Google Science Fair competition, at age 14! As a small girl, Lalita Prasida Sripada Srisai enjoyed long walks through her home country of India. She enjoyed seeing how the cultures varied between villages.
During her travels, she often encountered heaps and heaps of corn cobs baking under the sun. Lalita wondered how they got there, and what could be done with them.
She discovered that the farmers who grew corn would skim the kernels for consumption and toss the unwanted cobs on the side of the road. Even the animals wouldn't eat these dried up leftovers.
After a memorable encounter with a tribal farmer, Lalita had the idea to repurpose those abandoned, dehydrated corn cobs as part of a water filtration system. In the same way that a Brita filter traps unwanted particles as the water trickles into the pitcher, Lalita's invention uses corn to sponge up dirt in greywater collected from kitchen drain pipes and also from natural ponds.

Lesson Title:

Clean It Up!

Learning Objective:

Upon completion of this activity, students will have explored an engineering task to solve a problem, and will have gained an understanding of the challenges faced by people who do not have access to clean drinking water.

Background:

Many people in developing countries lack access to safe drinking water. Often, the only remediation available to them is filtration, in which they filter large particles out of the water using a cloth. However, for the water to be safe to drink additional stages of the treatment process are needed, especially the disinfection stage. This activity will focus on the filtration

stage. Your students will become engineers and design a better filter for the citizens in developing countries. Students will construct a filter, test it, and evaluate how effective it could be for supplying clean drinking water.

Materials List:

- Water

Contaminants for dirty water sample:

- Liquid food coloring
- Soil
- Beans
- Baking soda
- Shredded paper

Filtering Materials:

- Paper coffee filter for squares of paper towel
- Fabric scraps
- Cotton balls
- Small squares of mess or screen
- Sand
- Sponges
- Gravel
    - OR have your students brainstorm the day before and bring their chosen materials from home!

- Plastic cups and plastic funnels
    - OR repurposed water bottles: Cut the plastic water bottle in half; top half inverted becomes a funnel, bottom half becomes the collection cup!

Activity:

What does a filter do and what kinds of things can be considered “filters”? Explain that even our water needs to be filtered and sanitized before we can safely drink it, but imagine what it must be like for people that have very contaminated water and must filter it and clean it themselves. Fill a beaker or clear cup half full with water. Then add contaminants: food coloring represents chemical contamination, beans represent human and animal waste, potting soil represents earth, baking soda represents road salt and torn paper presents litter. Explain that this represents the contaminated water that millions of people must rely on to survive.

Put students into teams of 2 to 4. Each team should be given a filtering set up (cup and funnel or repurposed water bottle) and a set of filtration materials, as well as a contaminated water sample which will be used to test their filter when they complete the design challenge. Explain to your students that they are scientists and engineers and they have been hired to design the

best filter system they can with the materials they have been supplied. They can construct their filter any way they choose. Students should employ an Engineering Design Cycle to bring their ideas through from conception to construction to testing and evaluation. Once they have completed their design it will be tested using the "contaminated" water sample. If time allows, have the teams redesign their filter based on the evaluation of their first test results. The best design will be the one that produces the most clear, clean water sample!

Scale up Option:
For older students, it would be interesting to use "chemical filters" as well and see how they compare to physical filters. Using alum powder and chlorine tablets is a common way that some organizations teach communities to purify their water. (https://sciencing.com/use-powdered-alum-purify-water-7411961.html) Students can do both kinds of filtration and test which works better. For an added challenge, students can calculate the cost and accessibility of each kind of filter and decide which would be best for a community. (i.e. maybe one way does a better job of filtering but is way more expensive than the other way, so students have to decide which is more important.)

Take Action:
H2O for Life offers a service learning program designed to engage, educate and inspire youth to become global citizens. Choose a partner school in the developing world that is in need of water or sanitation, learn about the global water crisis and take action to make a difference. Visit our website at www.h2oforlifeschools.org to learn more!