

# STEM PATHWAYS

## Clean Water STEM Challenge!

### The Problem

Cloverfield's surface water resources are polluted. Soil, trash, oil and other objects as well as algae, bacteria and high levels of nutrients have been detected. Funding for a new water filtration system has been allocated to update the existing

### The Challenge

To create a water filter to obtain the purest filtered water for Cloverfield's water treatment plant before water enters the disinfection

### Find a Solution

**ASK:** What are some possible ideas?

**PLAN:** Test out your ideas

**CREATE:** Put your ideas to the test

**TEST:** How well did your idea work?

**IMPROVE:** Review results & make changes

### Things to Consider

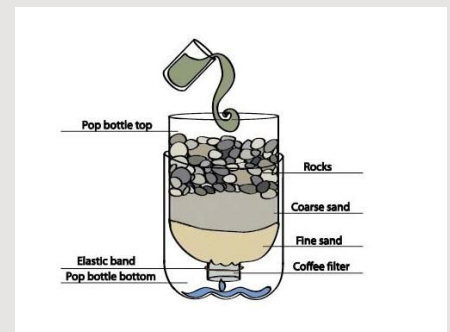
1. How is water filtered by nature?
2. What types of materials are used as filters for other products we use?
3. How can one tell when water is clean?
4. What processes are used to clean water that you could include in your design?



### Design Materials

**Choose a maximum of four different materials for your design.**

- Cheesecloth
- Paper Towels
- Cotton Balls
- Coffee Filters
- Aquarium gravel
- Play Sand
- Gauze
- Tulle/Netting
- Activated Carbon
- Uncooked Pasta or Rice



**SAFETY ALERT: Water filtered in this challenge CAN NOT be consumed by humans! The filtered water is not disinfected and is not safe for human use!**

Authored by: Patty House, OSU Extension, Clark County  
4-H Youth Development Extension Educator  
house.18@osu.edu 937-521-3865  
[go.osu.edu/4HSTEMpathways](http://go.osu.edu/4HSTEMpathways)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES



# STEM PATHWAYS

## Clean Water STEM Challenge!

### Design Set-Up and Teams

1. Table space sufficient for each group to work.
2. Cover tables for easy clean-up
3. Prepare simulated waste water to be filtered.
4. Post Sign – **Do Not Drink Waste Water or Filter Water! Not Safe for Humans!**
5. Divide youth into teams of two to four youth.
6. Introduce youth to the importance of clean water.
7. Describe the problem and challenge to the youth. Stress safety alert!
8. Explain that their water filter design will be evaluated on water clarity, change in pH and odor and removal of solids.

### TIME: 30 MINUTES

#### Materials and Supplies

- Cheesecloth
- Paper towels
- Cotton balls
- Coffee filters
- Aquarium gravel
- Play sand
- Uncooked pasta or rice
- Gauze squares
- Tulle/netting
- Activate carbon (rinsed and dried)
- 1 -16 oz. drinking bottle per team
- Rubber bands
- pH test strips
- vinegar or lemon juice
- Food coloring
- Vegetable oil
- Soil
- Mulch
- Measuring spoons and/or cups

#### Simulated Waste Water

Per 1 gallon:

- 1 to 2 cups of vinegar or lemon juice,
- 1 to 2 tablespoons of vegetable oil
- handful of soil, mulch and sand
- several drops of food coloring
- bits of paper



**SAFETY ALERT:** Water filtered in this challenge **CAN NOT** be consumed by humans! The filtered water is not disinfected and is not safe for human use!

### Engage the Learner

- Which contaminates will be easiest to filter? Which contaminates will be hardest to filter?
- What materials do you predict will work best to remove solids, neutralize odors, absorb color, remove oil, etc.?
- How will layering of materials and order of layers impact your filtering results?



### Observations & Conclusions

#### Observe your team's filtered water and compare to the original wastewater.

- How would you rate your design in removing solids, neutralizing odor, increasing clarity, and raising pH?
- Does your filter clean water sufficiently to move onto the disinfection phase? Why or why not?

#### Carefully take your team's filter apart and examine the materials used.

- Which material(s) trapped the solids?
- Which material(s) absorbed the color?
- Which material(s) removed the oil?
- What changes would you make to your design based on your results?

### STEM Career Path ...

#### Environmental Engineer

**Who else might be involved?** Civil and mechanical engineers, materials scientists, waste water treatment plant operators and managers and environmental scientists.

**Who benefits?** Improved water quality for everyone and municipalities and taxpayers.

**What other issues are environmental engineers helping to solve?** Solid waste disposal, recycling, air pollution control, climate change and environmental remediation.

Refer to Career Focus Card for more details



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

