Year 7 science
Clean water challenge

Australian Curriculum links:
Chemical sciences – Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques (ACSSU113)

In this activity[2], student groups investigate how to clean a dirty water mixture. The groups compete to see who can design a filter that produces the cleanest water in the shortest time.

Equipment

For the class

- large bucket of dirty water
- Whizzy's new adventures: Journey through the pipes storybook: Adventure 1

For each group

- plastic cups
- different filter media e.g. filter paper, sand, gravel of different sizes

Activity steps

1. Divide the class into groups of two or three. Explain that each group will participate in a class challenge to see who can create a filter that produces the cleanest water in the shortest time. Negotiate the challenge criteria with the class before they start. How are they going to judge the clarity of the filtrate? How are they going to measure the 'speed' of the filter? How will they combine these measurements to select a winning filter?
2. Ask students to predict the effect of using thick layers of filtering material. Recommend that they make the layers of each filtering material only one or two centimetres thick. Hopefully, this will conserve your supply of filter materials!
3. Review how to design a fair test and discuss why each filter material will need to be tested on its own before combining the materials. How are they going to measure and record their results?
4. Once the materials are tested individually, students can test the combinations of filter material.
5. Students evaluate their results so far and decide on the design of their final filter. Before building their final filter, each group will need to justify their design to you using their experimental results. You could ask such questions as:
    - What is your filter design?

[2] Adapted from: Walker M, Kremer A & Schluter K. (2007). Dirty water challenge. Science and children; Summer: 26–9.

- How did you use your experimental results to decide on the filter design?
- Are there any potential problems with this design?

6. Students then build their filters.
7. Once the filters are built, line up the filters in front of the class. Ask the students to predict which filter will be the most effective. Test each filter with about half a cup of dirty water.
8. To finish the activity, discuss the problems students had making the filters and how they could improve their design. Discuss why they still can't drink the water even if it is clear. What other contaminants are still in the water? Students can be prompted to suggest that there could still be salt, nutrients or bacteria in the water. Discuss what other techniques are required to remove these contaminants.

9 Compare the activity to the way that water treatment process engineers design and monitor the water treatment plant that supplies their drinking water. Read Adventure 1 of 'Whizzy's new adventures: Journey through the pipes'. Ask students where filters are used in the treatment process in the book and how harmful germs are removed.

10. Students write a scientific report or student journal entry about their findings from the investigation, including a recommendation for the most efficient combination of filter material to clean dirty water.