

STEM for Water Advice Book

Practical STEM solutions for conserving and using water wisely



Co-funded by
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A student-friendly book for schools and communities. Project 2024-2-PL01-KA210-SCH-000267079. It turns the supplied partner activities into investigations, recommendations and measurable proposals.

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Use the book to choose a water question, measure a baseline, test one change and present a result with its limitations. Teachers should supervise all experiments and approve any work on school water systems.

Start with a school water audit

Time how long a tap takes to fill a one-litre container. Flow in litres per minute = 60 divided by the number of seconds. Repeat three times, then compare with a follow-up after a repair, approved aerator or behaviour campaign. Record the number of users and the time of day.

Record	Method
Baseline	Average three flow tests or take a water-meter reading.
Intervention	Repair a leak or fit an approved device.
Follow-up	Repeat under similar conditions.
Saving	$(\text{Baseline} - \text{follow-up}) \div \text{baseline} \times 100\%$.

Student proposal

Form a water audit team, report leaks to the caretaker, and publish a monthly chart of verified savings.

Filter water and test the design

The project activity layers cotton, charcoal, sand, small stones and rocks inside an inverted bottle. Compare two designs using the same volume of cloudy water. Measure time, collected volume and appearance under identical lighting. Change only one design feature at a time.

STEAM 4 WATER. Filter of water

OBJECTIVE

Prepare a filter of water functional with materials that we can find in the high school or at home.

Learn different types of water and its pollution.

MATERIALS

- Cotton
- Coal
- Fine sand
- Small stones
- Rocks
- Water
- Plastic water bottle



THEORETICAL FOUNDATION

Water is an element that we need for our lives. For this reason, in some situations that we need potable water, we must know how to fabricate a filter of water.

Also there are some reasons to know if this water: its conductivity, the color...

PROCEDURE

1. Cut the water bottle by $\frac{3}{4}$ parts.
2. Turn the bottle so that the cap is facing down.
3. Put the ingredients in this order: cotton, coal, fine sand, small stones and rocks.
4. Put dirty water inside the bottle, but NOT clay.

[Activity sample: bottle-filter instructions from “filter of water”.](#)

Important: a classroom filter can make water look clearer without making it safe to drink. It may leave pathogens, dissolved chemicals and salts. Never drink experiment samples.

Investigate what water tests can tell us

Label samples of tap, rain, bottled and distilled water. Observe a drop of each under the same microscope magnification and sketch particles or visible organisms. Do not grow unknown microbes. Clean the work area and wash hands.

STEAM 4 WATER. Microorganisms in water

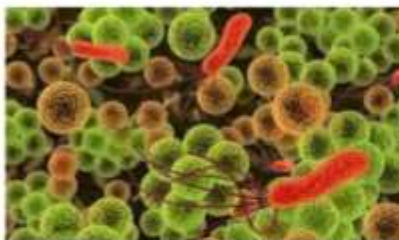
OBJECTIVE

See how many microorganisms there are in different types of water.

Learn more about which type of water is safe to drink.

MATERIALS

- microscope
- glass slides and covers
- pipettes
- distilled water
- tap water
- rainwater
- bottled water
- small containers
- labels or markers



THEORETICAL FOUNDATION

Water may appear clear to the naked eye, but it often contains a variety of microscopic organisms and particles. Different water sources have different levels of biological activity.

PROCEDURE

1. Collect small samples from different water sources in clean containers and label each container.
2. Place a drop of each water sample on a clean glass slide with the pipette and cover it.
3. Focus carefully and observe the content of each sample.
4. Sketch or record observations such as: presence of organisms, particles, relative cleanliness.

[Activity sample: the project microscopy investigation.](#)

Electrical conductivity, usually reported in $\mu\text{S}/\text{cm}$, depends on dissolved ions and temperature. A high reading alone does not prove pollution, and a low reading does not prove drinking safety. A microscope cannot establish that a sample is pathogen-free.

1. Say if the sentences are true or false, if they are false, correct them:

- The more electrical conductivity the water has, the more contaminated it is.
- There are seven types of water.
- The waste water it's which comes from the toilet and it's the most polluted.

2. Match the type of water with the conductivity:

- | | |
|-----------------------|---------------------------------|
| 1. River water | a) $459 \mu\text{S}/\text{cm}$ |
| 2. Potable water | b) $1838 \mu\text{S}/\text{cm}$ |
| 3. Grey water | c) $1050 \mu\text{S}/\text{cm}$ |
| 4. Waste water | d) $408 \mu\text{S}/\text{cm}$ |
| 5. WWTP effluent | f) $477 \mu\text{S}/\text{cm}$ |
| 6. Greenwall effluent | g) $1248 \mu\text{S}/\text{cm}$ |

3. Complete with the following words, they are two that you don't need:

Domestic use / Drinking water stations / River water / Wastewater treatment plants / Freshwater ecosystems / Greenwall / House use



Activity sample: water types and conductivity worksheet.

Design a water-efficient garden

The project presentation compared lettuce in wet and dry garden conditions. Extend the activity with equally sized plots of the same crop, soil and light. Compare a drip line with a watering can, or mulched and bare soil. Record rain, irrigation volume, soil moisture and growth each week.



Activity sample: contrasting garden plots from INS Ermessenda de Girona.

Water productivity = harvest mass in grams divided by applied irrigation in litres. Keep rainfall separate. Better growth in a wetter plot does not automatically mean the extra irrigation was efficient.

Student proposal

Choose locally suitable plants, mulch where appropriate, check soil moisture before watering, and use drip irrigation near roots. Compare plant health and water use over several weeks.

Collect rainwater and consider reuse

Potential harvest in litres $\approx$ roof area in $\text{m}^2 \times$ rainfall in mm $\times$ collection efficiency. A 20 m^2 roof with 10 mm rainfall and 75% efficiency could yield about 150 litres. A covered tank needs a debris screen, overflow and a maintenance plan approved by the school.

Greywater reuse can save drinking water for suitable non-drinking tasks, but it requires professional design and compliance with local health and plumbing rules. Never connect untreated greywater to a drinking-water system.

Teach water conservation with a quiz

Use the supplied Saving Water Kahoot to discuss the water cycle, freshwater and daily use. Ask pupils to justify answers and verify numerical claims against current sources before sharing them.



Kahoot
SAVING WATER

Questions (15)

1 - Quiz

How much of the Earth's water is freshwater?



▲ 20% ◆ 7,5%
● 2,5% ■ 12%

2 - Quiz

What activity uses the most water in an average household?



▲ Showering ◆ Watering the lawn
● Washing clothes ■ Flushing toilets

3 - True or false

Bottled water is always cleaner than tap water



◆ True ▲ False

4 - Quiz

What process turns gaseous water into liquid water?



▲ Condensation ◆ Evaporation
● Freezing ■ Melting

5 - Quiz

Where is the most of Earth's fresh water stored?



▲ Rivers ◆ Lakes
● Glaciers ■ Seas

6 - Quiz

Which of these is NOT a part of the water cycle?



▲ Evaporation ◆ Photosynthesis
● Condensation ■ Precipitation

Activity sample: questions from the Saving Water Kahoot.

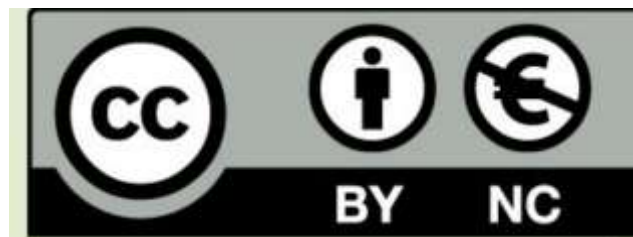
Five-week school challenge

Week	Action
1	Select a question and obtain permission.
2	Collect baseline data and note conditions.
3	Implement one approved change.
4	Repeat measurements and calculate the difference.
5	Ppresent a one-page evidence-based proposal.

Recording sheet

Date and place	Test conditions	Baseline	After change	Notes

Reflection: What changed? Were measurements repeated? Did weather or the number of pupils also change? What would you improve? Who can act on the finding?



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