MISSION 02

Fantastik'eau

I love water. I take care of it!

SAVING DRINKING WATER

CYCLE 3

CIEAU Centre d'interprétation de l'eau

Québec

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I love water. I take care of it!

SAVING DRINKING WATER

IWB
ACTIVITY ALSO AVAILABLE IN INTERACTIVE WHITEBOARD FORMAT!
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TEACHER'S GUIDE
CYCLE 3

C.I.E.A.U. Centre d'interprétation de l'eau

Québec

MISSION 02 : SAVING DRINKING WATER

GOAL OF THE ACTIVITY

Test the operation of a water-saving device for a showerhead.

DURATION

45 MINUTES

CONNECTIONS WITH THE CURRICULUM OF THE QEP

MATHEMATICS:

- Estimating a surface area
- Fractions
- Percentages

SCIENCE AND TECHNOLOGY:

- Scientific method
- Using simple measuring instruments
- Measuring quantities

MATERIALS FOR EACH TEAM OF 2–3 STUDENTS

- 1 pushpin !
- 1 small nail !
- 1 large nail !
- 2 measuring cups A
- 2 glasses made of clear, flexible plastic that each hold 250 millilitres of liquid B et C .
- 1 paper or aluminum plate with a hole having a six centimetres diameter. This plate will be used to support one of the glasses.
- Pencils and scissors
- Whatever you can find in the recycling bin to hold the bottle upside down!
- Water
- A bin to hold the water
- A time measuring device (clock, watch, stopwatch)

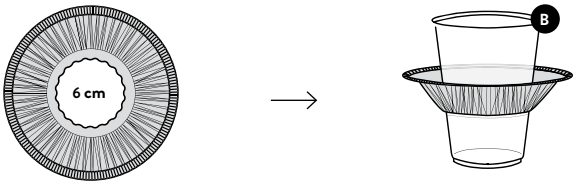
WARNINGS

It is recommended to have an adult use a drill, a hole puncher or another tool to make holes.

Make sure an adult is there to make holes in the glasses and manipulate the aluminum plate.

AQUA-MARY: If your chosen tool allows it, you can punch holes in several glasses at once by sliding one inside the other, to speed up the process.
Choose glasses made of clear and flexible plastic, since they allow students to see and better understand the final setup.

NOTE: The plate will be used to support the plastic glass. The size of the hole in the plate must be slightly smaller than the opening of the glass in order for the rim of the glass to be able to rest on the plate.



WALTER: Here is a real aerator to reduce the flow of a tap or showerhead. Aerators usually have a small opening and a screen that reduces the flow of water.
You could bring one from home to observe it!

BACKGROUND

Back at home, Wasteful Wally pretends to be an opera singer under the shower, while Conscious Charlie is left waiting for his turn to wash on the other side of the door. When he finally finishes, Wasteful Wally opens the door, and the bathroom is filled with water! Conscious Charlie is aggravated by all this wasted water, but Wasteful Wally tells him it isn't his fault: the showerhead is uncontrollable! Conscious Charlie is discouraged and unsure what to do...

THIS IS A JOB FOR
THE FANTASTIK'EAU CREW!

TEST THE WATER-SAVING DEVICE TO SEE IF IT WORKS

SCIENTIFIC METHOD: CALCULATING THE FLOW OF WATER

Hypothesis:

Encourage your students to directly formulate hypotheses.

CRYSTAL CLEARWATER:
Ideally, the hypotheses should come from the students. Here is some guidance you can give them if they have difficulty coming up with solutions:

1 -It is better to make big holes (with the big nail) than small holes.

2 -X holes can reduce the flow while still allowing people to wash themselves properly.

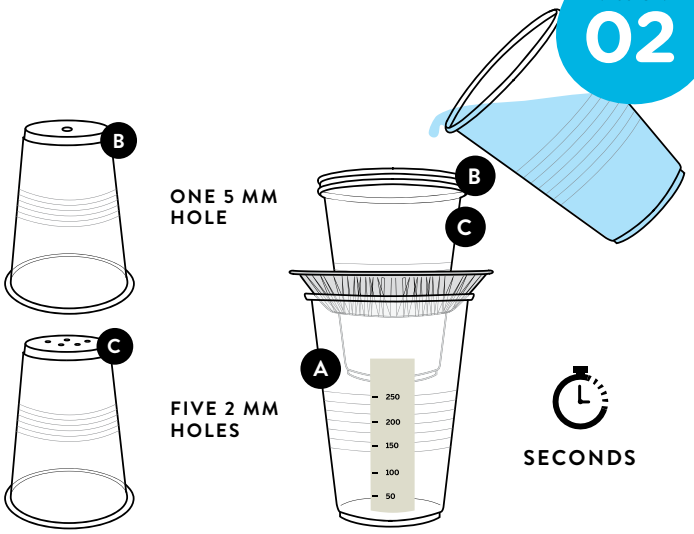
MATERIALS AND METHOD: MAKING THE WATER-SAVING DEVICE

Punch holes in glasses B and C. Start by taking the pushpin to make the holes, then use the nail to enlarge them. Afterwards, ask the students to think about how they are going to measure the water saved.

AQUA-MARY:
Ideally, you should give two glasses to each team. This way, the teams can test their hypotheses by changing the number of holes OR the size of the holes between glasses B and C.

EXTRA: ESTIMATE THE TOTAL AREA OF THE HOLES

The students can draw and estimate the surface area of their holes to find out what works best. They can draw the holes side by side to scale in the student workbook. You can help them add the areas and play with the units of measurement (see student workbook).



MANIPULATIONS

Up until now, everything could be done without getting wet! At this stage, we add the use of water. You can test the water-saving devices in a plastic bin or tray, or ask the teams to proceed one at a time in a sink to avoid spills.

Alternatively, you can make a hole with a six centimetres diameter (or with the same diameter as the glass) in a thick paper plate, insert your glass with the hole in it, and place everything on a measuring cup. Afterwards, all you need to do is pour the water into the water-saving device. Your students can also simply hold the glass over a measuring cup A.

The students calculate the volume of water lost in the filter and must note the time and the volume of water that fall into measuring cup A to calculate the flow of water (see student workbook).

JÉRÉMIE :
If your students are having difficulty doing the activity on their own, you can follow these steps.

1. Slowly pour water from a glass or a tap, as if it were coming from a showerhead without a water-saving device.
2. Calculate the volume of water poured in 20 seconds.
3. Repeat the same steps using the water-saving device they built.
   - Make sure the glass is full of water before beginning the test.
4. Note the volume of water saved in 20 seconds using the second measuring cup.

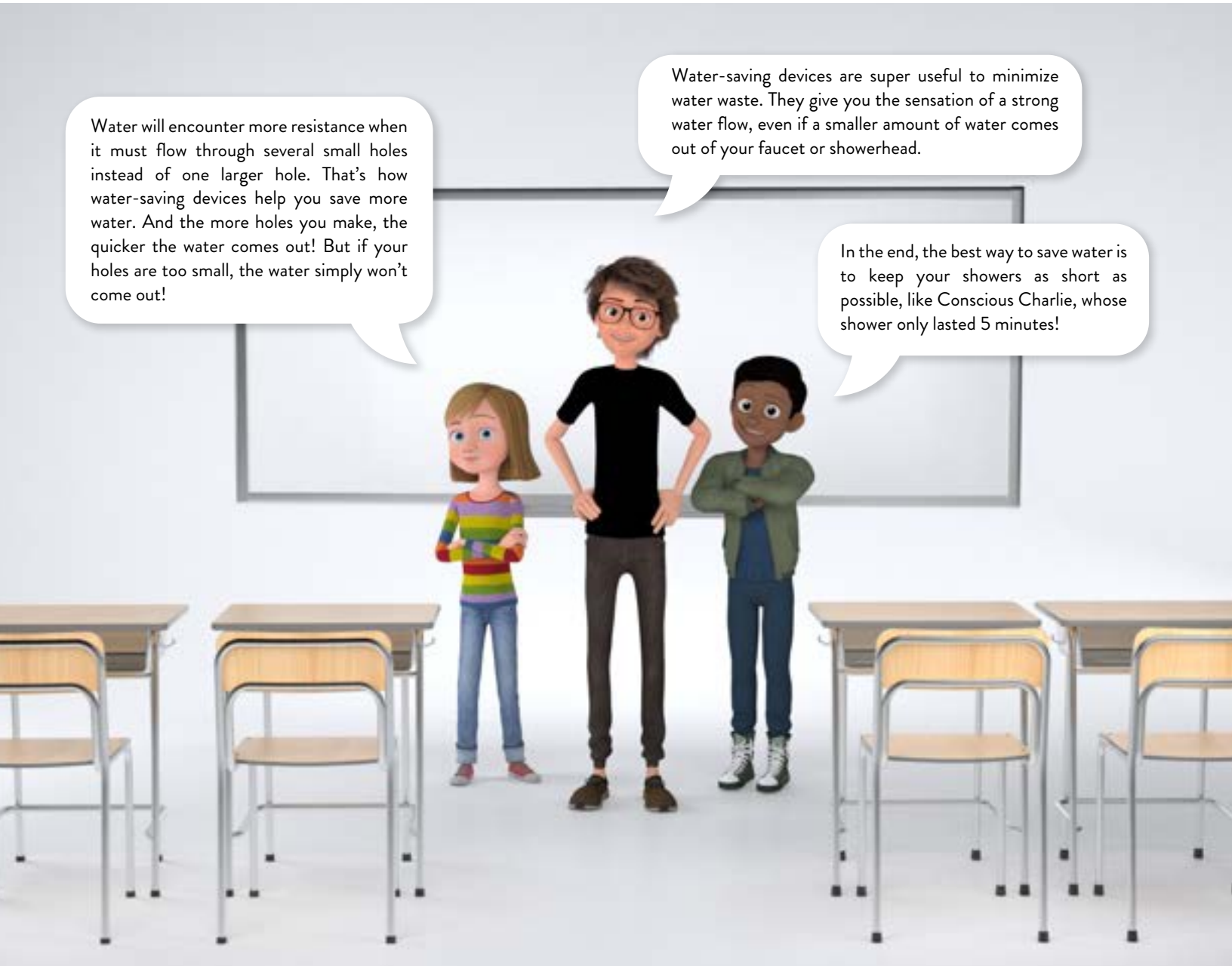
The more the glass is full, the greater the water pressure will be. Therefore, it's important for the glass to be as full as possible during the test in order to maintain pressure at the level of the holes. For more details on this subject, you can also do The Water Tower mission at Fantastik'eau cycle 3 complete guide.

CONCLUSIONS

RESULTS AND CALCULATIONS

See student workbook.

ANALYSIS: KEY POINTS TO REMEMBER, AND WHY WATER-SAVING DEVICES ARE IMPORTANT



DIVING DEEPER

CRYSTAL CLEARWATER:
Where, in your home, could you easily install a water-saving device like the one you just made?

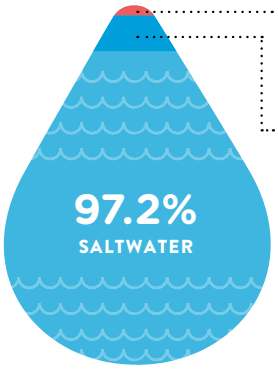
Kitchen faucet (sink), bathroom faucets (sink and shower), basement faucet (laundry sink), outdoor hose.

You can also try using a spray bottle whose water output you can control. What's more, you might find that you need a very small amount of water to wash your hands.

AQUA-MARY:
To save water, we can install water-saving devices, such as faucet aerators and low-flow showerheads. How do these devices give the sensation of a strong water flow?

These devices introduce air in the water, which offers the sensation of a strong water flow even if a smaller quantity of water comes out of the faucet. This principle makes it possible to save a greater amount of water. The water-saving devices that are available on the market perform better than the one you made with your class!

CRYSTAL CLEARWATER:
Using what you have learned, try to make a water-saving device that's even more effective!



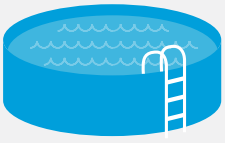
0.028%
FRESHWATER THAT IS ACCESSIBLE ON EARTH

2.8%
FRESHWATER THAT IS INACCESSIBLE

0.028%

Only a very small amount of the Earth's water can be used for human consumption. Whether we drink it or use it to put out fires, to have fun or to keep our industries running, all this water is extremely precious!

In comparison:



If all of the Earth's water were equal to one swimming pool ...

Here would be the equivalent amount of water from our ...

Snow and glaciers

Groundwater

Lakes and rivers

Atmosphere

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STUDENT WORKBOOK
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BACKGROUND

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THIS IS A JOB FOR **THE FANTASTIK'EAU CREW!**

DO THIS ACTIVITY WITH JÉRÉMIE

Watch the short video featuring Jérémie, and do the activity with him! All of the Fantastik'eau content and videos are available on the C.I.EAU's website at:

www.cieau.org/fantastikeau

MISSION
02

ANSWER ONE OF THE FOLLOWING TWO QUESTIONS TO FORMULATE YOUR HYPOTHESIS

To reduce the water flow rate using your water-saving device, is it preferable to:

1. Make large holes using the large nail or make small holes using the pushpin? _____

Or

2. Make five holes or a single hole? _____

What combination of holes should you use for your water-saving device? _____

FOLLOW THESE STEPS:

- Measure, cut out, and remove the bottom of the plate. You will use this holed plate to support the 250 millilitres glass on the rim of the measuring cup.
- Pierce one 5 mm hole in a 250 millilitres glass B and five 2 mm holes in a 250 millilitres glass C. !
- Place the glasses over a measuring cup, using the holed plate to support them.
- Gently pour water in the measuring cup A, as if it were flowing out of a shower head.
- Calculate the flow rate, i.e. the volume of water over a certain period of time.
- Write down the time required to collect a certain volume of water in the measuring cup.
- Try different combinations of glasses and holes to find the most effective water-saving device !

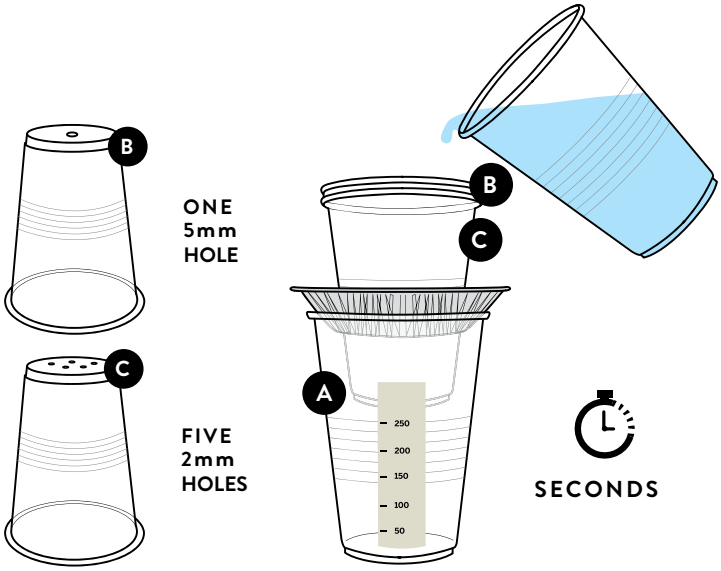


DIAGRAM OF YOUR WATER-SAVING DEVICE

Draw the size of the holes in your water-saving device to scale.

CRYSTAL CLEARWATER :
An actual shower with a low-flow shower head can save more than eight litres of water per minute—that's a 60% saving in potable water! And that's not counting the energy saved thanks to the unused hot water !

WARNING

It is recommended to have an adult use a drill, a hole puncher or another tool to pierce a hole.

RESULTS

Without a water-saving device

a) Flow rate = _____ ml ÷ _____ seconds = _____ ml/sec

With a water-saving device (holed glass)

b) Flow rate = _____ ml ÷ _____ seconds = _____ ml/sec

c) Compare the results: _____

ANALYSIS

Does the water flow faster with more holes? _____

Does the water flow faster with bigger holes? _____

CONCLUSION

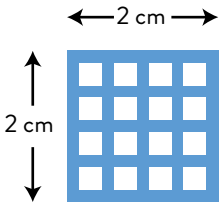
Explain how a water-saving device should be designed to be as effective as possible: _____

_____

_____

TEST YOUR SKILLS

Here is a diagram of the screen in a water-saving device. The size of each little white square is 3 mm X 3 mm.



Measure the outer perimeter of the screen: _____

What is the total area of the large square without the screen? _____

What is the area that is subtracted because of the screen? _____

STUDENT EVALUATION GRID—MISSION 2

Name : _____ Group : _____ Date : _____

	Exceeds expectations (4-5)	Meets expectations (3)	Does not meet expectations (0-2)
Hypotheses			
Materials, filtering media and protocol			
Process for measuring the results			
Reporting the results			
Flow rate calculations			
Analysis			

EXCERPT FROM:

Fantastik'eau! I love water, I care for it! :
The Fantastik'eau educational package: Complete Guide, 2nd edition

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CREDITS

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The full list of people who contributed to the project (employees, volunteers, contract workers) is displayed on the C.I.EAU's website.

Collaboration—education: Virus 1334, Le Récit
Graphic design: Virus 1334
Illustrations: Simon Says Design

The following is a list of books, websites, pages, and publications dealing directly with the subjects covered in the Fantastik'eau educational package.

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Centre d'interprétation de l'eau (C.I.EAU) www.cieau.org

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Directory of drinking water distribution systems, groundwater supplied (French only):
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SPECIAL THANKS

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