Can you solve a water crisis on an alien planet?
Session Leader Notes

You will need:

- Printed worksheets
- Access to computer, projector and sound to display Oxplore Challenge Slides
- Writing surface and pens
- Information sheets (printed)

General pointers on this session:

- This session takes approx. 45 minutes to deliver.
- This session works well with group sizes from approx. 8 to 40 pupils.
- Pupils will need to be broken up into small groups. Small groups should ideally not contain more than 4 pupils per group.
- This session is designed to build the Oxplore Key Skills of self-direction, creativity and problem solving.
- This session is focused on STEM subjects but skills are transferrable across all subjects.

Session breakdown:

Suggested timings (minutes)	**Slide content**	**Discussion points/Notes**
Prior to pupils entering room	Slide 1: Title	• Move to Slide 2 as soon as pupils begin entering
From first pupil entering room to all pupils seated	Slide 2: Brain teaser (I always run, but never walk I have a mouth, but cannot talk, I have a bed, but do not sleep, I have a mouth, but do not eat. What am I?)	• Pupils may start calling out ideas/discussing aloud.
0.00-3.00	Slide 3: Answer: a river	

3.00-5.00	Slide 4: Skills you'll be building today (Self Direction, Creativity, Problem Solving)	• Briefly introduce each skill, give more detail if this is group's first Oxplore Challenge • You could point out here that these skills are essential for careers and further study, and will help you in your GCSEs and A-levels.
5.00-6.00	Slide 5: Video Pt 1 (video approx. 01:12)	
6.00-12.00	Slide 6: Why do we need water anyway? Initial discussion questions.	• Direct pupils to discuss in pairs or groups • Some groups may require check-ins to keep on task. • Get them to share their answers with the rest of the class
12.00-13.00	Slide 7: Video Pt 2 (video approx. 1 minute)	
13.00-33:00	Slide 8: Challenge prompt:	• Put the class into small groups • Direct them to travel around the classroom picking up information from factsheets and complete the timed exercises in their handouts.
33.00-34.00	Slide 9: Action: Send Team Oxplore your worksheets	• If you would like to, please photograph pupils' work email it to us at (oxploreteach@admin.ox.ac.uk). • There is no obligation to do this, but it is very helpful for qualitative evaluation purposes. If uploading, please do not include identifying information about pupils, eg. crop/blur names. • Pupils may ask "Do people at Oxford really read it?", the answer to this is yes, as it helps us to understand whether or not our programmes are helping people to develop their skills

34.00-37.00	Slide 10: Have you practised these skills today? (Self-Direction, Creativity, Problem Solving)	• Pupils are asked to judge whether they have practised each key skill.
		• You could ask pupils to carry out their self-assessment by:
		  ○ Closing their eyes and raising their hands if they feel they have practised each skill
		  ○ Giving a thumbs-up/thumbs-down to say whether they feel they have practised each skill
		• If you are able to record how many pupils feel they have practised each skill, please email this to us (oxploreteach@admin.ox.ac.uk)
		• This is another good time to build academic self-concept by emphasising that these skills are important for your future, and will get stronger each time you use them.

37:00-40:00	Slide 11: Congratulations	• This could be a good point to gesture forward to future Oxplore Challenge sessions, or tally how many sessions the group has now completed if you are keeping count.

40:00-45:00	Slide 12: If you enjoyed this session, here are some subjects you may be interested in studying in the future…	• Here you can discuss the 'Take this further…' slide, this could be a useful jumping-off point for discussion about future areas of study and/or supercurricular opportunities available within your school/local area.

NAME: DATE:

Can you solve a water crisis on an alien planet?

Why do we need water anyway?

What do we use water for in our everyday lives?

Where does the water come from?

What challenges are there around the world in accessing water?

Can you access enough water to survive until the rescue spaceship arrives?

Use the information sheets and your imagination to create your plan in the spaces below and overleaf. You can use words and drawings to explain your ideas.

What challenges might you face in accessing drinkable water?

What can you learn from the local wildlife?
Hint: Use the Earth animals on your factsheet to imagine how alien creatures on a planet with limited water supply might look and behave.

How will you find and collect water?

How will you make the water safe to drink?

CHALLENGE SKILLS

Tick the skills you have practised.

Self-Direction ☐

Creativity ☐

Problem Solving ☐

Learning Resource

Natural Sources of Water

Rainwater

Rainwater harvesting is the collection and storage of rain, rather than allowing it to run off.

Rainwater is collected from a roof-like surface and redirected to a tank, cistern, deep pit, aquifer, or reservoir.

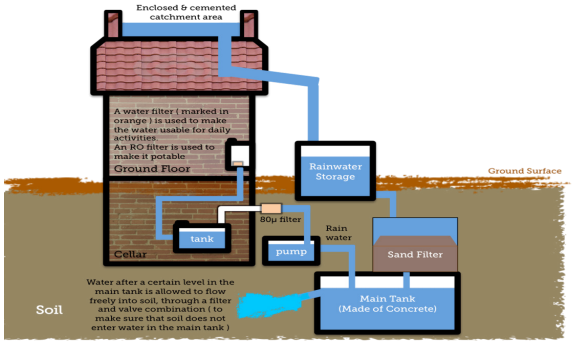

Image source: Adityamail, Rainwater Havesting, 2010. Accessed via https://commons.wikimedia.org/wiki/File:Simple_Diagram_to_show_Rainwater_Harvesting.png

Image source: Accessed via https://www.pickpik.com/landscape-shot-foreground-rocks-wast-water-lake-district-england-77562

Surface Water

Around two thirds of fresh water in the UK is taken from surface water sources. This means taking water from rivers and lakes. You can collect this water using reservoirs.

Tree Tapping

Trees and plants hold a lot of water. Trees like the baobab which lives in dry environments can hold up to 100,000 litres of water!

You can tap into these trees to access their water.

Image source: Bernard Gagnon, Adansonia grandidieri, 2007. Accessess via https://commons.wikimedia.org/wiki/File:Adansonia_grandidieri04.

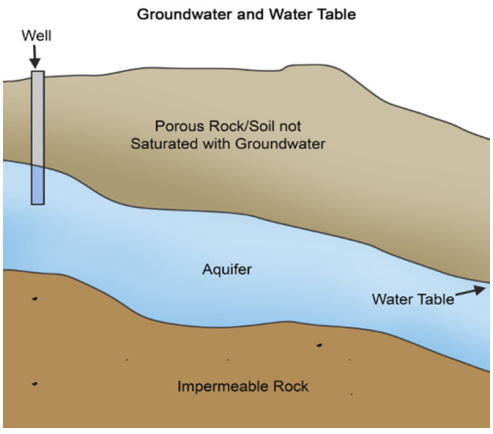

Image source: CK 12 Foundation, Ground Water and Table, 2022. Accessed via https://commons.wikimedia.org/wiki/File:Groundwater_and_water_table.png

Underground Aquifers

An aquifer is an underground pool of water, which is where the water in wells and springs comes from.

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Learning Resource

Collecting Rainwater

Image source: India Water Portal, Propagating rain water harvesting in North Bihar (Phase II). Accessed via https://www.flickr.com/photos/indiawaterportal/5498487031

Collecting Plant Transpiration

Transpiration: When plants "breathe out" water vapour during photosynthesis.

Image source: Accessed via https://www.jpl.nasa.gov/edu/resources/lesson-plan/transpiration-demo/

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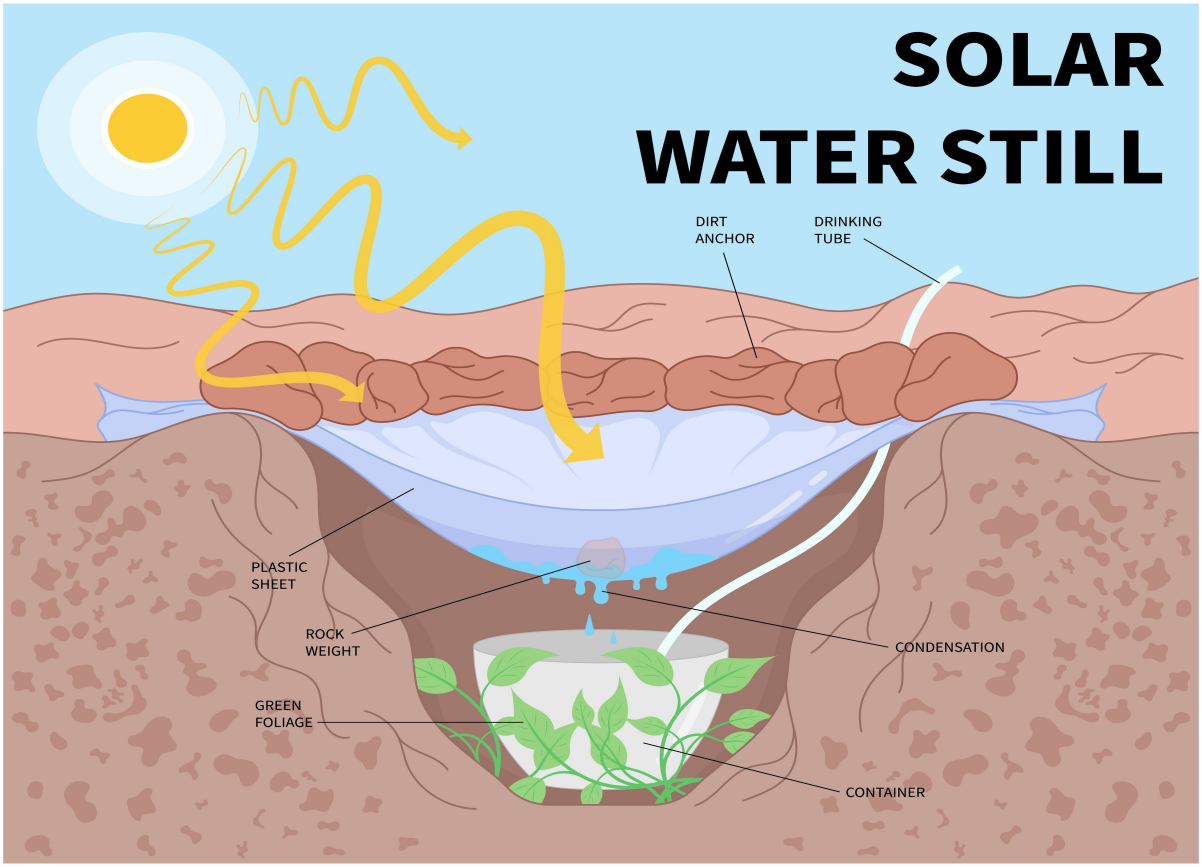
Learning Resource

Desalination

Desalination: the process of removing salt from water to make it drinkable.



A "solar still" is a simple device that utilises the evaporation condensation technique to convert impure salt water into distilled fresh water by eliminating dissolved salts as well as other dissolved impurities and suspended solids.

Learning Resource

Making sure water is safe to drink

We are very lucky to have clean and safe drinking water straight from our taps.

In some countries not everyone has access to safe drinking water.

There are lots of illnesses people could get by drinking dirty and contaminated water. For example, cholera, dysentery, and typhoid. With these types of diseases, cateria tend to infect the intestine and patients experience diarhhoea, stomach cramps, and sometimes vomiting. They can get dehydrated very quckly because they lose a lot of fluids.

Throughout history, there have been different theories about how these diseases spread.

In 1854, there was an outbreak of cholera in an area of London called Soho. Up until this time, many doctors and experts thought that cholera was transmitted through the air. Most people didn't question this theory, but a man called Dr John Snow decided to plot all the cholera cases on a map. As a doctor, he was keen to find out how and why people in a particular area were getting ill with cholera.

In the 1800s, people collected their water from pumps on the street. Dr John Snow plotted on his map where people got their water. From the data on his map, he worked out that people who collected their water from a particular pump were more likely to be struck down with cholera.

Dr John Snow's research showed that cholera spreads through contaminated water, but by the time he made the discovery the outbreak in Soho was already ending.

Learning Resource

Filtering water in the UK

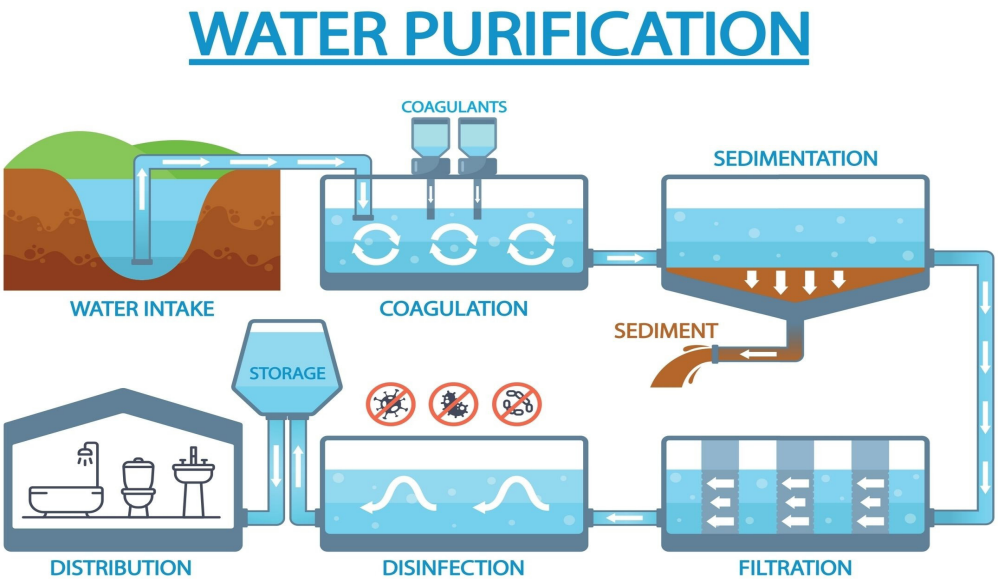
To make drinking water safe in the UK, it goes through a series of steps to remove all the different things that could harm us:

- Filters remove large objects from the water.
- Sedimentation tanks remove things like grit.
- Fine filters remove very small particles.
- Chlorine is added to kills germs.

Filtration actually happens naturally too. It is part of the natural water cycle and our filtritation machines, to some extent, mimic what happens in nature.

Rain lands on the ground and much of it runs into the ground, running through sand, soil, and gravel. Small particles in the water get trapped.

Here is a diagram of how our filtration system works



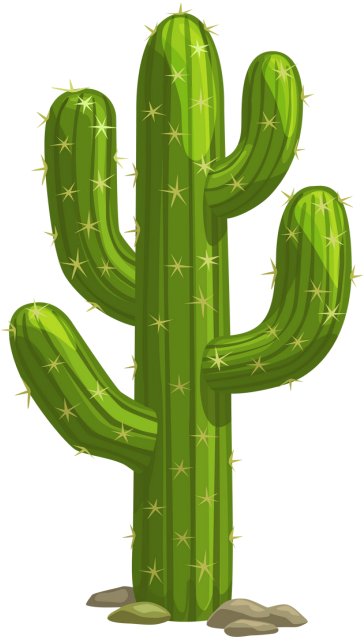
OXPLORE Teach

Learning Resource

How does wildlife adapt to water scarcity?

Camels

Camels store fat in their humps. They can go over a week without drinking, and when they do find water they can drink up to 46 litres!



Saguaro Cactus

The Saguaro cactus needs very little water to survive. Its trunk will expand so that it can hold as much water as possible.

Fennec Foxes

Fennec foxes burrow underground in the desert.

Their kidneys are adapted to restrict water loss, their extensive burrowing may cause the formation of dew, which can then be consumed, and they will receive moisture from the food they eat.

Can You Solve a Water Crisis on an Alien Planet?
Transcript pt.1

00:00 Hi, my name is Dr. Foteini Dimirouli.
I research and teach English literature at the University of Oxford. I'm interested in how authors record and present the changing world around them, and what an absolutely magical world it is! One that we constantly try to make sense of by writing about it in literature and studying it in science. Today we'll look into one of the building blocks of life, can you guess what it is? It's water. Water is vital to life. We use it every day for a variety of purposes.

00:35 There are a number of sources of water that people have used on Earth for many thousands of years. They include rainwater, which you might collect, surface water such as streams and rivers, water that resides in trees and that you can extract by tapping and even underground sources of water, which are sometimes known as aquifers.

00:51: Firstly, let's think about how we use water here on Earth. On your worksheets you've got a few questions to get you thinking about this. You have five minutes to discuss them in your small groups and the get ready to share with everyone.

Can You Solve a Water Crisis on an Alien Planet?
Transcript pt.2

00.01 Today, you are going to look at how you would solve a water crisis on an alien planet. In this scenario you and your group have crash landed on an alien planet. Your instruments tell you that there are trees and foliage around, so there must be water for these to thrive. Around the room you'll find a set of fact sheets with important information about how water works here on Earth.

00:25 Take a walk around the room and read about water sources, their uses and other interesting facts. Then you'll need to think about how you can apply this information to your crash-landing emergency. Think about what you need water for, how you can get access to it, what threats there are to the water supply, what you can learn from the plants and wildlife around you and think about how you can make any water you do find safe to drink.

00:48 Your job is to develop a water plan. That means identifying sources of water as well as ways to retrieve it and make it safe for human consumption. Goodluck!