Different Perspectives

Life is very different for people across the world depending on their access to fresh, clean water. Students will begin to understand the impact clean water accessibility has on communities and investigate ways to improve this access and provide fresh, clean water.

Subject area:

Science

Year level:

Year 7

Learning objectives:

- Understand water is an important resource that cycles through the environment.
- Be aware of the issues of water pollution and the importance of access to clean water.
- Experiment with filtering various substances from water by making their own simple water filters.
- Plan, conduct, measure and control variables when investigating scientifically.
- Summarise data and draw conclusions from results of scientific investigations.

Curriculum links

Earth and space science	ACSSU116
Earth and space science	ACSSU222
Chemical science	ACSSU113
Use and influence of science	ACSHE120
Nature and development of science	ACSHE119

Cross-curriculum priorities: Sustainability

OI.1	The biosphere is a dynamic system providing conditions that sustain life on Earth.
OI.3	Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.
OI.4	World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice, are essential for achieving sustainability.
OI.7	Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

General capabilities

Literacy

Information and communication technology (ICT) capability

Critical and creative thinking

Personal and social capability

Ethical understanding

Potable water

Students will gain an understanding of the difficulties other countries face without fresh clean water. They will then apply their understanding to design their own filter to clean dirty water.

Time required:

1 hour

Resources required:

- **iPad or computer per student**
- **Various materials for student filter prototypes such as:**
  - PVC piping
  - Coffee filters
  - Gauze material
  - Gravel
  - Charcoal
  - Cotton balls

Preparation:

Ensure access to:

1. Centre for disease control and prevention
2. Potable water
3. Ted Talk: Michael Pritchard on how to make filthy water drinkable
4. Up sick creek

Steps:

1. Engage the students with this game-based investigation from the Centre for disease control and prevention.
2. It has been raining for weeks in Kenya's north eastern province. The rain should be a welcome relief after the drought, but several villages are flooded and many villagers are complaining of fever, muscle pain, weakness, and dizziness. Students will work to solve the Level 1 Mystery up sick creek (scroll to the right of menu reel).
3. Students write a definition for potable water in their student workbooks.
4. Introduce students to real world applications with a Ted Talk from Michael Pritchard on how to make filthy water drinkable.
5. Students then need to research, design and create a cost-effective, reusable water filter.
6. They need to prove their prototype will make dirty water drinkable in seconds to ensure an emergency water supply can be safely accessed in times of emergency.

Supplies for the future

Students will learn about the impact of population growth on water supplies for the future. They will explore experiments online before designing their own to assess impacts on river health.

Time required:

1 hour

Resources required:

- **iPad or computer per student**
- **Student workbook**

Preparation:

Ensure access to:

1. Global scarcity of water
2. Salinity fact sheet
3. Water quality
4. Fair test

Steps:

1. Students are to move through the chapters of the ABC digital book Global scarcity of water to gain an understanding of the water cycle and how population is impacting future supply.
2. Students need to understand Australian rivers and landscapes are under threat to rising salinity. Ask them to analyse the salinity fact sheet and water quality information to recognise salinity impacts to water and land. They should discover it will result in the loss of both aquatic and terrestrial biodiversity, affect some of our most productive land and impact our river health
3. Next, students are to learn how to conduct a fair test.
4. Ask students record in their workbook:
   a. What is a 'fair test'?
   b. What is the relationship between a 'control' and 'variable'?
5. Students will then design their own fair test to understand the impact on river health when we change the level of salt or temperature of the water.
6. Students will need to record their investigation in their student workbooks.

Salty soil and water

Salinity has many effects on soil and plants. The most obvious effect (at high enough concentrations) is that salinity kills plants and leaves the soil bare. Students will carry out three experiments involving salinity, linking the impacts to water scarcity and global food production.

Time required:

1 hour

Resources required:

- **iPad or computer per student**
- **Activity page 1: Salinity**

Preparation:

Ensure students have access to:

1. Department of agriculture WA

Steps:

1. Using a variety of salt experiments, set up research stations to rotate through a series of investigations. Students will:
   a. Examine the effects salt has on soil structure.
   b. Investigate the difference between dissolved and suspended particles in water.
   c. Identify levels of salt in soil samples.
2. Students need to complete the activity page, answering questions about each experiment and linking their learnings to how water scarcity and salinity issues are a threat to global food security.

Salinity

Salinity has many effects on soil and plants. The most obvious effect (at high enough concentrations) is that salinity kills plants and leaves the soil bare. But what happens to the structure of the soil itself?

Where salt concentrations are high, the soil may separate when watered. In extreme cases, the soil can take on a powder-like appearance. Sodium ions exchange for calcium ions on the clay particles. The loss of electrostatic attraction (Ca++ to Na+) between the clay particles causes them to disperse. On drying, these soils then become sealed and limit the infiltration of water into the soil. Slow drainage through the soil may reduce plant growth and promote erosion.

Investigation One:

Soil structure and salinity

Equipment required:

- Clay soil
- 6 petri dishes
- distilled water
- various salt solutions
- water softener or washing soda

Scientific Inquiry:

1. Place 20 grams (3 teaspoons) of soil into six petri dishes.
2. Add a different salt solution to five of the petri dishes (label them carefully).
3. Leave one dish without any salt solution.

Answer the following questions:

1. What effect does salty water appear to have on the soil?

2. Does this effect change with different concentrations of salt?

Activity page 1: Salinity

3. How might the change in soil structure affect plant growth?

4. Once the soil has dried out, describe the appearance of the soil in each dish. Is there any evidence of 'crusting'? How might this affect plant growth?

Investigation Two:

Dissolved and suspended solids in water

Polluting materials are either dissolved or suspended in water.
Suspended contaminates are much easier to remove than dissolved contaminates.

Equipment required:

- 2 large glass beakers or jars
- table salt
- blackboard chalk or talcum powder
- spoon or stirring rod

Scientific inquiry:

1. Fill the beaker with tap water.
2. Place a teaspoon of table salt into one beaker and stir. Note what happens to the salt.
3. Place a teaspoon of chalk into the other beaker and stir. Note what happens to the chalk in the beaker.

Answer the following questions:

1. Which material was dissolved in the water and which was suspended?

2. Which material would be easier to remove? Why?

3. How could we detect the presence of salt in the water?

Activity page 1: Salinity

4. In your groups discuss how we could remove the chalk, outline the method and then carry out your ideas.

5. Again, in groups decide how you would go about removing the salt, outline the method and then carry it out.

6. How could this investigation be relevant to a developing country and their drinking water?

Investigation Three:

Salinity in soil

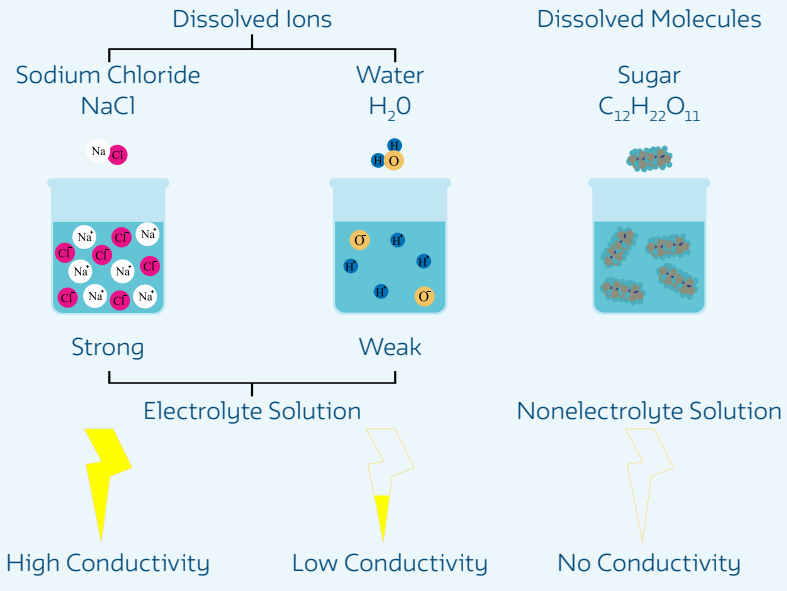
While some salts can improve soil structure and encourage growth of plants, as concentration increases it can cause stress on the plants. Excess salt in the soil around the root zone reduces the amount of fresh water available, forcing the plant to work harder at finding water. Salinity can also affect the physical properties of soil by binding it together into aggregates. This process known as flocculation is beneficial for the plant to a point but again, high levels can have a negative and potentially lethal effect on plants.

Equipment required:

- Electrical Conductivity (EC) meter
- 3 x 10 grams of dry soil samples (e.g. sun or oven-dried) from different areas of the school or community
- 100 mL beaker
- 150mL distilled water
- stirring rod
- standard salt solution

Procedure to test soil salinity:

1. Weigh out 10 grams of dry soil.
2. Grind the soil sample with a mortar and pestle or a rolling pin until all the lumps are gone. Remove any gravel.
3. Put the 10 grams of soil into a 100 mL beaker and add 50 mL of distilled water. (Soil salinity is conventionally determined by a 1:5 ratio.)
4. Stir thoroughly then let stand for at least 5 minutes.
5. Calibrate the EC meter using a standard solution.
6. Stir the soil/water mixture again.
7. Test the salinity of the soil/water mixture and record the result.
8. Refer to Department of agriculture WA to interpret measurements and soil salinity.



Activity page 5: Salinity

Answer the following questions:

1. What are you investigating in your experiment?

2. State the variables for the experiment

Independent variable What will I change?	Dependent variable What will I measure?	Controlled variables What will I keep the same?

3. Make a prediction about the results of your demonstration. Why do you think this will happen?

4. Draw a labelled diagram of the equipment set up.

Activity page 6: Salinity

5. Write the method you used to conduct this demonstration.

6. Design a table for recording investigation results. Label all relevant columns.

7. Scientific knowledge has changed our understanding of the world. Outline the impacts of rising salinity on the water table and how developing countries can overcome the impact of this issue for their crops and drinking water?