



# DITCH THE DIRT

Teacher's guide



[practicalaction.org/schools/ditch-the-dirt](https://practicalaction.org/schools/ditch-the-dirt)

**Practical  
ACTION**

**Ditch the dirt is an exciting STEM challenge for pupils aged 8-14 years. It enables them to investigate ways of cleaning dirty water through sieving and filtering to remove solid 'dirt'. It can also be extended to investigate ways to make water safe to drink.**

The challenge can be used to deliver parts of the formal science, design and technology, and maths curriculum in the UK and/or for an enrichment day, STEM/science club activity or as part of a primary to secondary transition activity. Pupils can also gain a CREST Award through taking part in the challenge.

The teacher's guide is supported by a PowerPoint (PPT) presentation, pupil activity sheets, a poster and certificates. They can all be downloaded from: [practicalaction.org/schools/ditch-the-dirt](http://practicalaction.org/schools/ditch-the-dirt)

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## Learning objectives

Through engaging with the Ditch the dirt challenge, pupils will:

- gain practical experience to reinforce their learning around separating mixtures and contaminants
- develop problem-solving, team working and presentation skills
- discover how STEM can help solve global issues and achieve the UN Sustainable Development Goals.

## Curriculum links

STEM subjects provide great opportunities for teachers to include authentic global contexts and global learning in their teaching.

To see where the Ditch the dirt challenge supports the delivery of the formal science curriculum for England, Northern Ireland, Scotland and Wales please go to: [practicalaction.org/schools/science-curriculum](http://practicalaction.org/schools/science-curriculum).

Within the D&T curriculum pupils will gain technical skills and knowledge.

# Overview of Ditch the dirt

Outline	Teaching material	Timing (min)
<b>Introduction to the context</b>	<b>PPT slides 2–3</b>	5 mins
<b>Starter activities</b>		
a. A daily task	<b>PPT slide 4</b>	15 min
b. Life without clean water	<b>Pupil activity sheet</b> - <i>Photographs from Turkana (one set per group)</i>	10 min
c. The Sustainable Development Goals	<b>PPT slides 5–6</b> - <i>Sustainable Development Goals (one per pair)</i> - <i>Global Goals display materials (one set per class)</i> <a href="http://practicalaction.org/schools/global-goals-display-materials">practicalaction.org/schools/global-goals-display-materials</a>	15 min
d. Investigating water quality	<b>PPT slides 7–8</b> <b>Pupil activity sheets</b> - <i>Investigating water quality (one per pupil)</i> - <i>Water grading strips (one per pair)</i>	20 min
e. Investigating sieving	<b>Pupil activity sheet</b> - <i>Investigating sieving (one per pupil)</i>	15 min
<b>Main Activity – Making a water filter</b>	<b>PPT slides 9–12</b> <b>Pupil activity sheets</b> - <i>Ditch the dirt challenge (one per group)</i>	60 – 120 min
<b>Feedback</b>	<b>Pupil activity sheet</b> - <i>Team feedback (one per pupil)</i>	20 min
<b>Worldwide solutions</b>	<b>PPT slides 13–16</b>	5 min
<b>Celebrating success</b>	<b>PPT slides 17–18</b>	5 min

## Introduction to the context

Before launching into the main Ditch the dirt challenge, you might choose to get pupils thinking about their own use of water before reflecting on what it might be like if they didn't have clean water piped to their homes.

To help pupils estimate how much water they use on a daily basis, have a 2 litre and/or larger 10/20 litre container to hand. PowerPoint (PPT) slides 2-3 will guide you through some questions.

## Starter activities

### a. A daily task

An activity that helps introduce pupils to the task of collecting and carrying water, as undertaken by millions of people worldwide on a daily basis.

Create six 'ground water holes' by pouring varying amounts of water into the bowls and trays. We suggest at least has only a tiny amount of water in it. Then add different amounts of dirt to the bowls and trays to simulate mixed levels of dirty water at the different water holes.

Place the bowls in different parts of the classroom and/or outdoor space. If possible, place some of the 'ground water holes' further afield than others. You might like to put photographs of the water holes close to the bowls.

Divide the water collecting equipment onto different tables or leave in one place for the pupils to select.

Organise the class into groups of 4/6 pupils. Introduce their task of water collection for their household with PPT slide 4. Give the pupils a minute to select their water collecting equipment.

Now, give pupils up to 5 minutes to see how much water they can collect for their household from the ground water holes. Ask pupils to measure how much they collected and feedback results.

## Follow up questions

What were the main problems your group had when collecting and carrying water?

Can you think of a way of overcoming those problems?

## Resources

### Equipment

- Six bowls or containers of varying sizes – washing up bowl, mixing bowl, science tray, etc.
- Water and 'dirt' (coffee granules, soil, sand, leaves, stones)
- Water collecting equipment – plastic cups, small water bottles, spoons, etc.
- Measuring jug (one per group)

### b. Life without clean water

Hand out the *Photographs from Turkana*, one set per group. Ask pupils to identify any difficulties the people in Turkana might experience when collecting and using the dirty water for everyday tasks, such as washing, cooking and drinking.

### c. Sustainable Development Goals

Now pupils are aware that access to clean water is a global problem, it is useful for them to be aware that lots of people and organisations are working to find solutions.

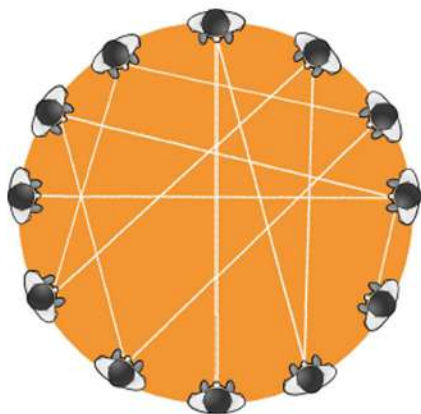
Use PPT slides 5-6 to introduce the Sustainable Development Goals (SDGs) also known as the Global Goals. Do this by explaining that in 2015 the United Nations identified a number of problems faced by people and communities around the world. They then came up with 17 SDGs which they agreed to work towards to help solve world poverty by 2030.

Global goal 6 on Clean water and sanitation is the most relevant goal to Ditch the dirt. It has a target for everyone in the world to have access to safe drinking water by 2030.

Hand out copies of the *Sustainable Development Goals* sheet to help aid understanding of what the Global Goals are. Ask pupils which ones might be linked to some of the problems faced by people in Turkana who don't have access to clean water.

Now carry out our Global Goals string activity. This helps pupils see the interconnections between the goals.

1. Hand out all the symbols to start with, then enough of the images for each pupil to have something to hold. For younger pupils, or to simplify the activity, you may wish to cut the targets off the bottom of the symbols.
2. Ask the pupils holding images to 'pair up' with the correct Global Goal.
3. Ask pupils to stand in a circle facing inwards and showing their Global Goal symbols and images.
4. Hand one end of the string to the pupil holding Global Goal 2 and ask the pair which of the other goals they think 'Zero hunger' may link to, and why. An example may be a link to health and wellbeing because people who don't have enough to eat cannot be healthy. Ask them to keep hold of the end and pass (or throw!) the ball of string to the pupils holding that Global Goal and image.
5. Ask the same question of this pair of pupils, and again ask them to keep hold of the string but pass the ball to the pair who have a Global Goal they think links to theirs, and explain why.
6. Continue until you have a spider web effect.



7. Ask the pupil holding Global Goal 6 (Clean water and sanitation) to pull on their string. When other pupils find their string moves explain that this is

because everything is interconnected; when you make progress on one Global Goal it affects the others.

## Resources

### Pupil activity sheets

- *Sustainable Development Goals* (one per pair)
- *Global Goals display materials* (one set per class)  
[practicalaction.org/schools/global-goals-display-materials](http://practicalaction.org/schools/global-goals-display-materials)

### Equipment

- String

## d. Investigating water quality

An investigation to help pupils analyse the physical quality of water. Use PPT slides 7 and 8 to introduce the investigation.

Prepare four samples of water in large jugs with different levels of dirt/soil/leaves. Pour water from each sample jug into four plastic cups and place a set of four samples on each table for pupils working in small groups.

Split the class into small groups and hand out the *Investigating water quality* and *Water grading strips* worksheets. Demonstrate how they need to analyse one sample at a time and record their results. Firstly, they need to comment on the odour/smell of the water. Then they need to pour the water into a glass beaker and, using the *Water grading strips*, decide which opacity grade matches the appearance of the water samples.

An optional activity to quantify the opacity of the water would be for pupils to use a computer programme or a data logger.

## Resources

### Pupil activity sheets

- *Investigating water quality* (one per pupil)
- *Water grading strips* (one per group)

### Equipment

- containers with 'dirty' water (ideally 4 water samples with different levels of contamination)
- plastic cups
- glass water beaker





## Main activity - Making a water filter

Introduce the main challenge, set in Turkana, using PPT slides 9-12. Ask pupils to recall what some of the problems are for people using dirty water for tasks such as washing and drinking.

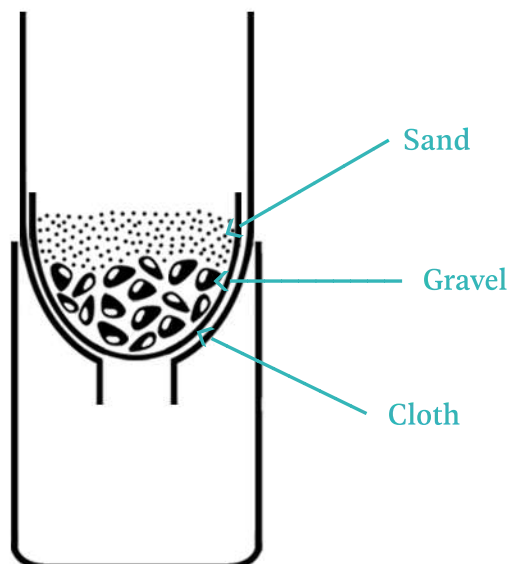
Divide the class into small groups of 4-6 pupils. You might choose to demonstrate how the pupils can make and test different materials in their water filters. Give each group approximately 4 litres of the dirty water and a set of the Ditch the dirt challenge sheets.

Explain that they have a set time (30 minutes) to experiment using different materials to develop their filters before the final challenge. Ask them to record the results of their tests on the first *Ditch the dirt challenge* activity sheet. Remind them to allow time to present their work at the end.

You may wish to give pupils a free rein to design the style of their own filter using litre bottles, plastic tubs, tubing, etc. Show younger or less able pupils how to design a simple filter, made by cutting approx 15 cm off the base of the 2 litre plastic bottles and placing the base under the neck of the bottle to catch the filtered water.

### For your eyes only!

The following diagram might be useful for a basic design (if you show it to pupils their tendency will be to try and copy the design and we want them to come up with their own).



### Extension/homework activity

For older students or more able pupils you might choose to add in an extension to this investigation that includes a chemical analysis of pH or bacterial analysis.

## e. Investigating sieving

An investigation that helps pupils understand that sieving is a method of separating solids from liquids.

Divide pupils into small groups, hand out the *Investigating sieving* worksheet and equipment. Using the worksheet as a guide explain how to carry out an investigation to see what contaminants can be removed by sieving alone.

### Resources

#### Pupil activity sheet

- *Investigating sieving* (one per pupil)

#### Equipment

- a container with 'dirty' water that includes coffee, mud, sand/soil, leaves and small twigs
- sieves with different mesh sizes
- measuring jug
- one clear plastic cup or glass beaker

## Prompt questions

How can you change the rate / flow of filtration?  
(e.g., depth of layers, materials used to make the layers)

What kind of 'dirt' contaminants will your filter not remove?  
(e.g., soluble and dissolvable materials such as salts)

Can you think of other ways to remove solid dirt from water?  
(e.g., distillation methods such as evaporation and condensation)

For the competitive part of the challenge, give the groups 5 minutes to filter a minimum of 100 ml of water. Once the time is up, ask each group to measure out 100 ml of their filtered water into a glass beaker. Pupils should analyse the quality of the filtered water and record their results on the *Ditch the dirt* activity sheet.

## Resources

### Pupil activity sheets

- *Ditch the dirt challenge* (one set per pupil)

### Equipment

- a range of junk modelling equipment, to include 2 x 2 litre plastic bottles, large plastic tubs, card, plastic piping, Bunsen burner, tubing, etc.
- bucket/container (for the dirty water)
- measuring jugs
- materials for filtration layers (marbles, gravel, play sand, fine sand, cotton wool, cloth, tights, filter paper/paper handtowels)
- elastic bands

## Feedback

We suggest that pupils present their model to the rest of the class reflecting on how well they worked together, problems they solved, etc. (this will be necessary if you are planning for your pupils to gain a CREST Discovery award).

## Resources

### Pupil activity sheet

- *Team feedback* (one per pupil)

## Extension/Homework activities

### Maths

*Costing our water filter* can be added in here as an extension or supplementary activity.

### Safe to drink

Discuss that the water in their filters may look cleaner but is not safe to drink. Use the pupil activity sheet *Safe to drink* to enable pupils to decide what contaminants will still be in their filtered water. You could also ask them to divide the contaminants into the 3 groups on PPT slide 8: physical, biological and chemical.

### Research

Pupils can carry out their own research on cleaning water using the *Research: safe to drink* activity sheet. This could focus on contaminants that are not physical so pupils could then consider how to adapt their own filters to make the water safe to drink.

Visit this useful website:

[epa.gov/ccl/types-drinking-water-contaminants](http://epa.gov/ccl/types-drinking-water-contaminants)

## Worldwide solutions

Use PPT slides 13-16 to show some of the ingenious solutions Practical Action uses around the world.



## Celebrating success

### CREST Awards

Taking part in Ditch the dirt is a great way for pupils to gain a CREST Award. The challenge is aligned to the Discovery Award, but can be used towards achieving a Superstar Award or as the starting point for a Bronze, Silver or Gold Award.

The CREST Discovery Award is generally undertaken by 9-14 year olds. It can be achieved in 3-5 hours. CREST Bronze, Silver and Gold Awards are designed for pupils aged 11-18.

For more information on CREST Awards go to: [crestawards.org](http://crestawards.org)

For further ideas for Bronze, Silver and Gold projects linked to global issues go to: [practicalaction.org/schools/global-project-ideas](http://practicalaction.org/schools/global-project-ideas)



### Big Bang Competition

Pupils aged 11-18 and in full time education/training who have taken part in a STEM challenge can enter their work into the Nationwide Big Bang Competition.

Prizes include industry/scientific site visits, and a chance to represent the UK at international contests. Being a part of the competition is an inspiring and valuable experience for all young people involved.

To find out more go to: [competition.thebigbangfair.co.uk](http://competition.thebigbangfair.co.uk)



[practicalaction.org/schools/ditch-the-dirt](http://practicalaction.org/schools/ditch-the-dirt)

### Great Science Share for Schools

Having taken part in the challenge, pupils are encouraged to join in the annual Great Science Share for Schools campaign. It's their chance to share their project with new audiences in or beyond their own schools. To find out more and register your school to take part visit: [greatscienceshare.org](http://greatscienceshare.org)



### British Science Week

Ditch the dirt would be a great activity for your class or year group to do during British Science week in March each year. To find out more go to: [britishscienceweek.org](http://britishscienceweek.org).

To find out if your school is eligible for a grant go to: [britishscienceweek.org/about-us/grants](http://britishscienceweek.org/about-us/grants)

