



# THE PUPIL PIPELINE RESOURCES

## KS2: SCIENCE AND DESIGN & TECHNOLOGY

### WHAT IS THE PUPIL PIPELINE?

WaterAid provides clean water, sanitation and hygiene education to some of the world's poorest people. Just one of the communities WaterAid will be reaching is a primary school near **Finote Selam, Ethiopia**. The school and the surrounding village have no access to water. There's no working toilets in the school building either.

The Pupil Pipeline is a fun and educational water delivery challenge for schools that will help bring clean water to communities around the world, like Finote Selam's primary school.

**The challenge?** Pupils need to work together to transport water with as little waste as possible. 10 litres, over 50 meters, within 20 minutes, without anyone leaving their spot! Anything goes: buckets, bottles, jars, cups or even wellies.

**These teaching materials add context to the Pupil Pipeline to ensure that pupils have a broad understanding of the importance of water and a foundation from which to begin exploring wider, global issues associated with water.**

### GRAVITY LESSON PLAN: AIMS

- To understand the force of gravity.
- To examine how WaterAid uses gravity to transport water from one area to another in places where there is no easy access to clean water.

## KEYWORDS

- Forces
- Gravity
- Gravity flow scheme

## RESOURCES AND MATERIALS

- Boxes of materials and household items

(for example plastic jugs, yogurt pots, straws, tubes, takeaway containers, sticky plastic, tape, funnels, plastic milk bottles etc)

- Gravity starter sheet
- Gravity flow system diagram
- Design and evaluation sheets

## CURRICULUM LINKS

**KS2 Science:** Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.

### KS2 Design & Technology:

**Design:** use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups; generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design.

**Make:** select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately; select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities.

**Evaluate:** investigate and analyse a range of existing products; evaluate their ideas and products against their own design criteria and consider the views of others to improve their work.

**Technical knowledge:** apply their understanding of how to strengthen, stiffen and reinforce more complex structures.

## ACTIVITY: GRAVITY FLOW

**Starter:** Give each pupil a **gravity starter sheet** to fill in, recap and review their knowledge of gravity.

- Using the gravity starter sheet, recap what gravity is.
- Explain to your pupils that they will be building a **water transportation system** that uses gravity to get water from one place to another as part of their learning for their Pupil Pipeline challenge.
- Ask the pupils what they usually do if they need to get a drink of water or wash their hands. **Where would they go to get water from?** Explain that in some places, people do not have taps in their homes and instead have to walk many miles to fetch water from rivers or streams.
- Ask the pupils what they think the problem might be with this water. Explain that it is dirty and causes illness.
- Tell the pupils that **WaterAid** is a charity that works to provide clean water to some of the world's poorest communities by using low cost and simple solutions. One of the solutions they use for communities where the nearest water source is high up in hills or mountains is the **power of gravity**.
- Ask the pupils why they think that gravity would help to get water from somewhere high, down to somewhere low.
- Display the **gravity flow system diagram** on the whiteboard. Ask the pupils to guess what they think it is and how they think it works. Use the labelled diagram (in the ppt) to explain how it works.
- Split the class into **teams** to work on planning, designing and building a **water transportation system**. The system should transport water down to the ground into a container from a height of at least 30cm using everyday objects and materials. The system must not lose water along the way.
- This will be **tested** by measuring the amount of water poured into the system and measuring how much water is left when it reaches the bottom.
- Ask the pupils if any have ever played the game mouse trap? Explain that the game follows the same logic as their challenge.

## ACTIVITY: GRAVITY FLOW



- Explain that they will be competing against other teams in their class to create **the most effective gravity flow system**.
- Give each team a **box of materials and a design sheet** per pupil.
- They should come up with a **team name** first, record this on their sheets and fill in what they are designing and why. They then need to look through their materials.
- In their teams, they should begin to think about which of the **materials and items** they would like to use.
- They will need to consider how their **structure** will stand upright and keep water from spilling out.
- They can **test** out their materials and items before beginning their designs.
- In their teams, the pupils should share their designs and any feedback should be taken into account to improve them. They should then take a **team vote** to decide which design to go for.
- They should use their **final design**, to make their water transport systems.
- Allow time for **testing and adjustments**.
- Set a **competition day** and invite senior staff to come along and help judge. It may be a good idea to set up their inventions in a hall or outdoors to take account of water spillages!
- Each pupil should fill in their **evaluation** on their design sheet taking into account any feedback from the competition day.



**The winning designs could be used as part of your Pupil Pipeline event, to help kick off the challenge.**

## PLENARY



Recap how just the force of gravity can get water from one place to another without the need for electric motors or pumps. How is this possible?

Reflect on how they worked as a team and what they feel their contribution was to their team effort.

# GRAVITY STARTER SHEET

## What is Gravity?

Read each sentence and fill in the spaces using the wordbank to help you.

1. Gravity is a type of \_\_\_\_\_.
2. Gravity is a \_\_\_\_\_ force.
3. Gravity pulls everything \_\_\_\_\_.
4. Gravity pulls objects downwards using \_\_\_\_\_.
5. Gravity on \_\_\_\_\_ is different from the gravity on other planets and on the moon.
6. Objects weigh \_\_\_\_\_ on the moon.

## Wordbank

pulling  
force  
weight  
downwards  
less

# GRAVITY FLOW SYSTEM DIAGRAM



# DESIGN AND EVALUATION SHEET

<b>Name:</b>	
<b>I am designing a(n):</b>	
<b>It will be used by or for:</b>	
<b>I will use these materials:</b>	<b>I will use this equipment:</b>
<b>I have chosen these materials because:</b>	<b>I have chosen this equipment because:</b>
<b>Design 1:</b>	
<b>What do my team members think of my design?</b>	
<b>Design 2:</b>	
<b>What do my team members think of my design?</b>	

# DESIGN AND EVALUATION SHEET

**I have chosen Design 1/Design 2 because...**

## **Plans**

*Use the starter sentences to help you if needed.*

**I will make my design in the following way:**

*First I will need to*

*Next I will need to*

*After that I will need to*

## **Evaluation:**

**Any changes made to your original design?**

**Why did you make these changes?**

**How did these changes improve your water transport system?**

**What would I do differently?**