



Science /Design Technology

What is the Pupil Pipeline?

WaterAid provides safe water, sanitation and hygiene education to some of the world's poorest people. In the next year millions of people will experience the transformative effect of having clean, safe water and sanitation for the very first time.

It costs just £2 for one meter of pipeline needed to transport clean, safe water across the developing world. The Pupil Pipeline challenge is a fun and educational challenge for schools to help raise these vital funds for WaterAid.

Pupils need to pass one or more buckets, bottles, jars, cups or even wellies filled with water along the line without dripping a drop. Or can they design their own water carrying device or pipe.

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

These activities aim to develop understanding of the force of gravity, by examining how WaterAid uses gravity to transport water from one area to another in places where there is no easy access to clean water. Pupils will also have the opportunity to build their very own gravity flow system.

Key words

- Forces
- Gravity
- Gravity flow scheme

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 not easy access to clean water.

Resources and materials

- Gravity flow system posters
- Household items (i.e. plastic jugs, yogurt pots, straws, tubes, take away containers, sticky plastic, tape, funnels, milk bottles)
- Jane's story and Welcome to Simango school
- Design sheets

Curriculum links

KS2 Science

SC4 Physical processes: Objects are pulled downwards because of the gravitational attraction between them and the Earth.

KS2 Design and 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

Starter

- Give each pupil a gravity starter sheet to fill in and recap their knowledge of gravity.

Activities

- 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. Read the **Welcome to Simango** and **Jane's story** sheets to help the class visualise what it is like to be without clean water.
- Tell the pupils that WaterAid is a charity that works to provide safe 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 safe water 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 to explain how it works.
- Split the class into teams to work on planning, designing and building a water transportation system which gets 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. Watch the following short videos to inspire your pupils with ideas for using gravity as a mode of transport:

www.youtube.com/watch?v=H6VmiYI_IRk

www.youtube.com/watch?v=lyh19A6CmBw

www.youtube.com/watch?v=Gx8peNet8Sg

- 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 mind-map their ideas onto a large sheet of paper and then individually create designs on their sheets.
- 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.
- **Optional:** 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 flow system diagram

