Questacon at HOME

Activity sheet

Walking Water

Background

Have you ever wondered how trees transport water all the way to the top of their canopy? This is possible partly due to a process called ***capillary action***. Capillary action pulls water through tiny tubes or channels, even against the force of gravity! In a tree, water travels up channels hidden inside the trunk and branches. There are even networks of tiny channels inside paper towels, tissues and sponges! This also allows water to be drawn upwards. In this experiment, we will explore how capillary action can pull water up and over a bridge made of paper towels.

Materials

- Water
- Food dyes (not necessary, but it makes it more fun and easier to see!)
- At least two small containers, for example:
  - Cups, jars or drinking glasses
- Something absorbent, for example:
  - Paper towel
  - Tissues
  - Toilet paper

Safety

Water can create a slipping hazard if spilled. Adult supervision is recommended for young experimenters.

Procedure

Position the containers in a row, filling every second container around ¾ full of water. If you can, add different colours of food dye to each container with water in it. Create 'bridges' between the containers using your absorbent material (e.g. strips of paper towel). One side of the material will be dipped into the water in one container and the other side will hang into the empty container.

Now, wait and observe what happens to the water!

Activity sheet - Walking Water

Tips & tricks

- What happens if the containers are arranged in a circle with red, yellow and blue food dye in every second container?
- If you are having trouble getting water to move between the jars, try using larger pieces of absorbent material.

What's the Science?

Capillary action describes how liquids can be pulled through capillaries (i.e. thin tubes or channels). This will only happen if a liquid is attracted to the material of the tube. If you look closely at water sitting in a drinking glass, you should see a tiny bend in the water surface up the side of the glass. This happens because the water is attracted to the glass surface. If your drinking glass suddenly became super thin (e.g. one millimetre across), the bends where the water meets the glass would be strong enough to pull the water upwards!

Water moves up through the paper/tissue rather quickly as there are loads of tiny channels that you can only see using a microscope. Paper and tissues are made up of cellulose fibres which are derived from wood. Between the cellulose fibres there are air pockets (this is why a paper towel feels so soft). Water is highly attracted to cellulose fibres, so it rushes up the paper towel to fill these air pockets and get as close to the cellulose as possible. It is this force of attraction between the molecules inside absorbent material and water that drives the capillary action.

What questions could I ask?

- Why does the water travel up the paper?
- How could we make the water move faster?
- Would this work with other liquids?

What's next?

- **Colourful flowers:** Put food dye in a vase of water, and then place a cut flower in the vase (light coloured flowers work best). Leave it for several days and watch as the flower changes colour from the coloured water moving up the stem. Try cutting the stem in half lengthways and separate it into vases with different coloured water.
- **Materials challenge:** Try using different materials to make your bridges and see which can carry the water higher, further or faster.
- **Making your own capillaries:** Try finding other objects which can act as very thin tubes - such as the inside of a pen refill, or very tightly rolled paper or plastic. Does coloured water move up your capillary?