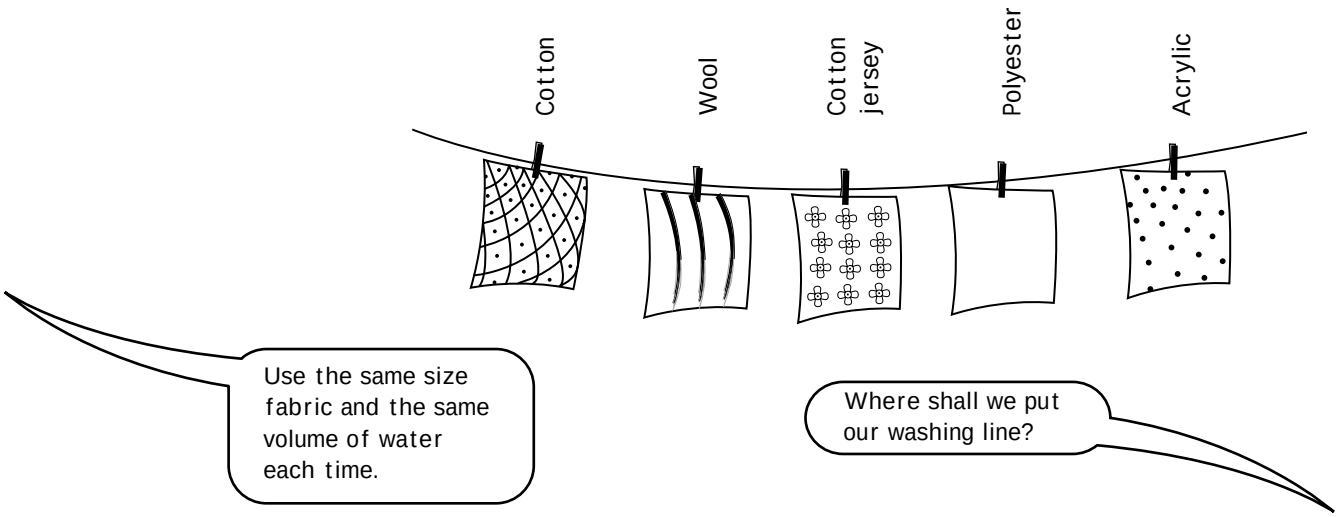
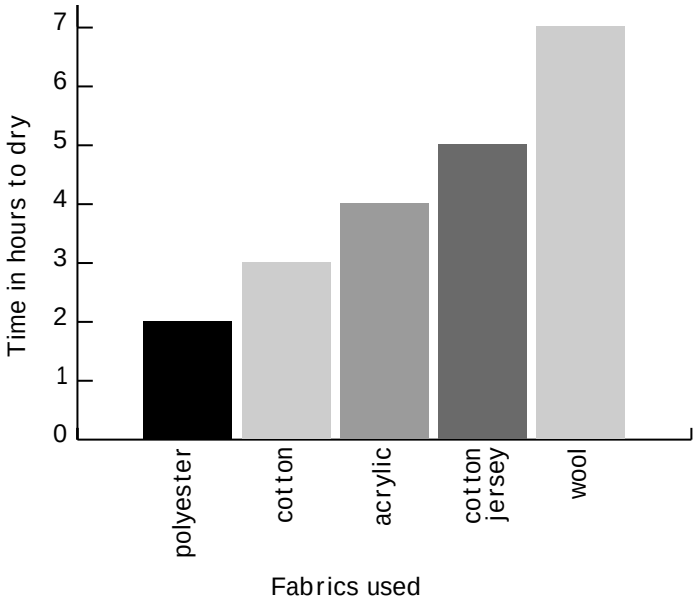
Drying fabric **Investigate** Which fabric dries the fastest? An opportunity to involve fair testing using equal sized pieces of fabric, measured equal volumes of water, timing, and recording results in a block graph. This is also an opportunity to use science in an example of an everyday activity.



A graph to show the time taken for fabrics to dry

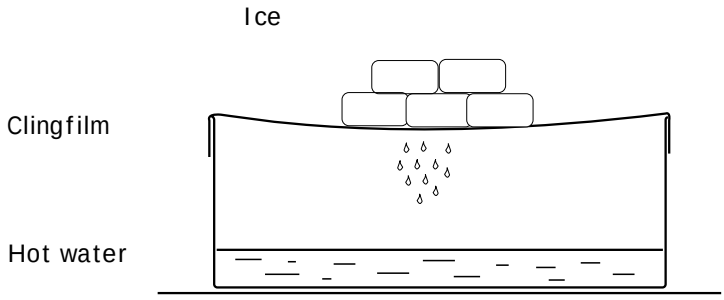


Graphing package

Small ‘washing lines’ can be set up in different areas of the classroom, eg in front of a fan, over a radiator. Different groups of children can contribute identical sized but different types of material for each line. So, for example the ‘cotton’ group has identical sized pieces of cotton on different lines in the classroom. The pieces of material are wetted with the same volume of water. As there are two variables here, the type of material and classroom condition, this may be more suitable for the more able children. Other children could carry out this activity with one variable only.

Discuss the results and get the children to identify various situations in an everyday context where evaporation occurs, include the use of drying equipment such as hairdryers and tumble dryers.

What happens if we use cold water and no ice?



Condensation and evaporation as part of the water cycle

(a) **Water vapour can condense to form water and this is the reverse of evaporation** This can either be a whole class or group demonstration. Set up a bowl of warm water, cover with a dish containing ice. As the water evaporates and hits the cold saucer, it condenses and 'rains'.

(b) Repeat the activity using cooler water, which just takes longer to work. Discuss this with the children. Water does not need to be hot to evaporate and condense, but the process is faster with hot water.

(c) Small groups of children can have their own screw top jar with ice inside. After about 5 minutes condensation is seen on the outside of the jar, where water vapour in the air has cooled against the cold glass.

Some children have great difficulty with the concept of condensation and are convinced that the ice melts and goes through the jar or the saucer. Try using a very cold glass straight from the refrigerator and eliminate the ice.

Water is one of the most important substances on Earth, being essential to all living cells, 75% of our bodies is made up of it! Water covers 70% of the earth's surface and is the most common liquid we come across, 97% is salty and 3% is fresh. Of the fresh water, 85% is in the form of ice and the air we breathe includes **water vapour,** the gaseous state of water. It is continually recycled on our planet. Water from the earth's surface in the form of seas, lakes, rivers, down to puddles **evaporates** and returns to the atmosphere as water vapour. This becomes cooler, **condenses** to form tiny water droplets or ice crystals and forms clouds. When these water droplets become too heavy to remain floating in the air, they fall as rain or snow and this is known as **precipitation.**

Evaporation

When water boils at 100 °C it changes from a liquid into a gas that we call 'steam' and moves into the surrounding air. However, boiling does not need to occur for evaporation to take place. In any quantity of liquid, the molecules at the surface have less interaction with each other than those in the body of the liquid. These molecules leave the surface and evaporate into the air. This gas is not hot like steam, but cool and is called a **vapour.** As it happens at the surface and is dependent on temperature, the larger the surface area and the warmer it is the faster it happens. If a wind or stream of air is present to blow away the slowly evaporating liquid molecules, they move away faster allowing the next layer of liquid to evaporate, so speeding up the process. So large, shallow, puddles dry up faster than narrow, deep ones containing the same volume of water. They all dry up faster on a warm, sunny or windy day.

Another effect of evaporation is that of cooling. As surface liquid evaporates, energy is transferred from the liquid to the vapour resulting in the liquid becoming cooler. This happens in sweating, as the sweat on the surface of the skin evaporates the skin cools down. The faster this happens, the more dramatic the effect, eg surgical spirit on the skin evaporates very quickly leaving the skin feeling very cold.

Condensation precipitation and the water cycle

As water evaporates from the oceans, seas and rivers, which are two thirds of the Earth's surface, the air becomes filled with water vapour and may become humid. If this continues, it becomes saturated with water vapour and can hold no more, but this depends on the air temperature. The higher the temperature, the more water vapour can be held. As saturated air cools down, the water vapour changes back into the liquid state or **condenses** and then forms tiny water droplets in a cloud, mist or fog. If this is near the ground it is a mist or fog, but clouds form well above the ground and if they are cold enough, they consist of ice crystals. As these ice crystals or water droplets bump together and get bigger, they become too heavy to remain floating in the air on the upward air stream and they fall. This is called **precipitation**. If the air is warm, the ice crystals melt and fall as rain, if not, they fall as snow. This process of evaporation and condensation is the **water cycle.**

Transpiration and the water cycle

Plants also contribute to the water cycle during a process called **transpiration.** Water is taken up by their root system, is transported in specialised cells in the stem, travels up to the shoots and leaves where it evaporates. Trees lose vast amounts of water through transpiration, a large oak may transpire up to 360 litres (dm^3) of water per hour on a sunny day! This is especially significant in areas of the world where there are large forests, creating a humid atmosphere. This water vapour eventually falls as rain to continue the cycle, but where large areas are de-forested this cycle is disturbed changing the humidity of the air and the subsequent rainfall.

The Transpiration Stream