

# Recording the weather

## Make your own weather station

Key Stage 3 Geography (Weather and Climate), Key Stage 3 Design and Technology (Iterative process of designing and making)

01

April 2014

### Learning Outcomes:

This extended project uses scientific observation to show how the weather we experience is formed by a number of linked atmospheric variables, including air pressure, wind direction and rain fall. Pupils identify information that needs to be collected, design and produce specialist apparatus to gather data, then analyse that data to make predictions (forecasts) about conditions in the immediate future. Individual aspects of this project can be used in isolation, eg creating a barometer to study changes in air pressure.

By the end of this activity pupils will have:

- Conducted experiments and research to deepen their understanding of the atmospheric variables responsible for our weather.
- Designed, produced and evaluated instruments to gather specific data.
- Analysed results to make predictions about weather in the immediate future.

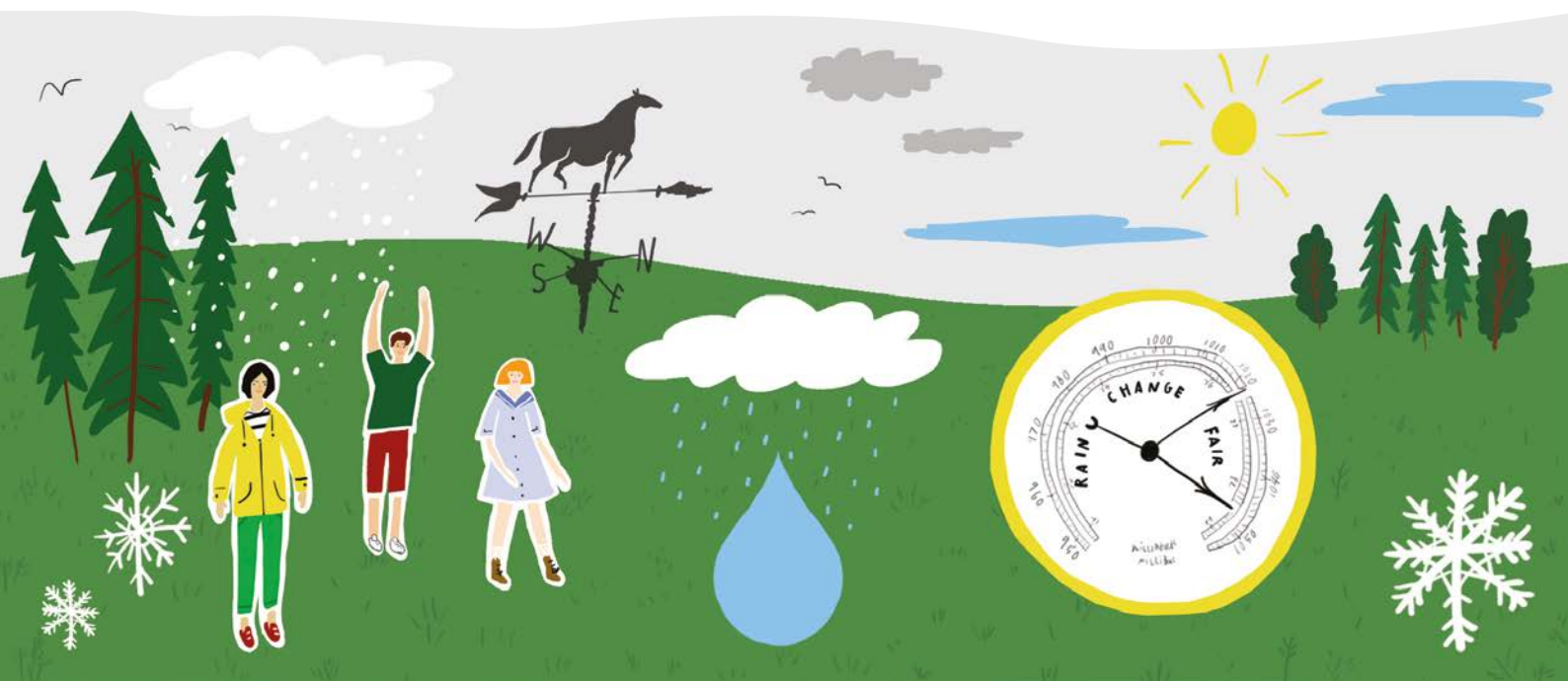
### What you'll need:

- A selection of craft materials (see activity notes)
- Scissors/craft knives
- Coloured tape or marker pens
- Smartphone, tablet or timelapse camera

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# Activity:

## Introduce...

**What?** Different atmospheric variables combine to create the weather we experience. By measuring some of these variables we can predict others.

**How?** Use weather reports (either written, video or audio) as the basis of a discussion about how we can predict the weather. What are our predictions based on? A prediction can be made by comparing the current conditions with a trend we have observed in the past. For example: 'The last time we observed an increase in air pressure and south-easterly wind direction, we had fine sunny weather soon afterwards. We are observing the same conditions now so we can predict the same weather with the information we have.'

## Demonstrate...

**What?** Simple instruments can be used to record some aspects of weather.

**How?** Demonstrate how a simple instrument can be created to record one of the variables responsible for our weather. You could use a pre-prepared model or work through an example with the class. See activity notes to find out how to create some simple recording instruments.

## Explain...

**What?** Other variables can be recorded if the right instrument is available.

**How?** As a class, design a working weather station that records a number of variables. Brief the class as small design teams, giving each a different variable to measure. The task should follow a design and technology style workflow. Pupils use research to identify and understand needs, then design an instrument that will record their variable. Different groups could look at air pressure, wind direction, wind speed, rainfall, or cloud cover.

## Apply...

**What?** Create weather recording instruments and test them.

**How?** Pupils now build their weather instruments. Most projects can be completed with basic tools and you should specify the tools and materials available in the initial briefing. Once the build is complete, the instruments should be set up in a weather station and left to make their recordings. Extensions to this project could include the groups presenting and explaining their designs to the class, or an environmental assessment to determine where the weather stations should be located.

## Summarise...

**What?** The variables combine to create the weather we experience.

**How?** After 24 hours the data should be collected from the instruments. This will vary in format depending on the instrument, so each group will now need to present their data in a way others can use. For example, they could create graphs to show how the variable changed over the time period. The data can then be interpreted to create a short term weather forecast for the school.

## Activity notes

The ideas below are all easy to produce with minimal tools and materials. In most cases they will need to be calibrated with professionally manufactured equipment before results can be collected (eg create the graduated scale on your DIY barometer by copying it from a real barometer).

### Taking continuous measurements

Most of the equipment below provides an instantaneous read out. For example, the anemometer tells you the wind direction at the time you are looking at it. A simple method of logging data over a longer period is to use a time-lapse camera app on a tablet or smartphone. Set it up so that it can view all of the instruments in your weather station and take a photo every 15 minutes. This will provide plenty of data for your pupils to work from.



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### Projects

#### DIY barometer

##### What you'll need:

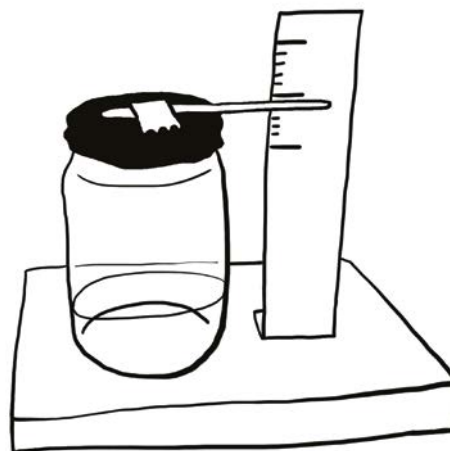
- Jam jar
- Balloon
- Lollipop stick
- Cardboard
- Sticky tape
- Base board

##### What to do:

1. Remove the lid of the jam jar and attach the jar to the base board.
2. Use the balloon to seal the top of the jar and tape the lollipop stick to the centre of the balloon.
3. Draw a measuring scale on a piece of cardboard and position it so that one end of the lollipop stick points to the scale on the cardboard.

##### How it works:

As air pressure increases, it pushes down on the balloon, causing the tip of the stick to rise on the scale. When it decreases, the air in the jar expands, pushing the tip down on the scale.



## DIY anemometer and wind vane

### What you'll need:

- Balsa wood
- Thick dowel rod
- Thin dowel rod
- Cardboard
- A yoghurt pot
- Sticky tape
- Map pins
- Compass

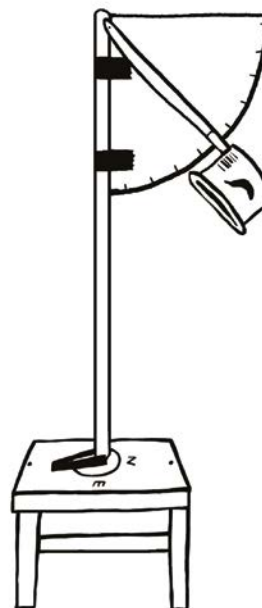
### What to do:

1. Make a stand from balsa wood and cardboard, with a central hole for the thick piece of dowel rod to sit in. Slot in the piece of dowel so that it stands vertically, but ensure that the rod can rotate freely.
2. Make a cardboard vane that will turn the device to face into the wind. Attach this to the thick piece of dowel with sticky tape.
3. Make a measuring arm from a yoghurt pot attached to a length of thin dowel rod. Attach this arm to the top of the thick dowel rod using a map pin, so that it pivots at the top of the vane. As the wind speed increases, the measuring arm will be pushed higher. Draw a scale on the vane so that you can accurately measure this movement.

4. Add a direction indicator to the stand, at the bottom of the thick dowel, to show which way the vane is pointing. Make sure you line it up with a compass when you position your device.

### How it works:

As the wind changes direction, the vane will turn the device into the wind. The strength of the wind is measured by observing the pivoting movement of the measuring arm.



## DIY rain gauge

### What you'll need:

- Plastic pop bottle (two-litre size)
- Sticky tape
- Marker pens
- A pair of scissors or a craft knife

### What to do:

1. Carefully cut the top off a two-litre pop bottle using a craft knife so that you are left with a straight edge and the neck of the bottle.
2. Turn the neck upside down and push it back into the bottle. Use sticky tape to cover sharp edges if needed.
3. Use a marker pen to add a scale to the side, making it easy to tell how much rainfall has been collected.

### How it works:

As rain falls, the open bottle will collect the water and channel it into the storage area at the bottom. Using the top as a funnel helps to stop too much of the stored water evaporating away.

