

Session plan: extreme weather forecasting

Session overview

Where do we get weather information from? How accurate are different types of prediction? Introduction to the Intel weather kit. What does weather station data from extreme weather look like and how can we predict it? How does weather affect people's lives and the environment?

Depending on the context of the class, this session will take around two hours.

Session opener

Play this starter video as students settle: <http://bit.ly/1xZ7bKX>

Objectives	Activities	Resources	Outcomes
<i>Preamble</i> Where do we get our weather information from?	Discuss or map: What different ways can you find out what the weather is like tomorrow? How reliable are they and how often are they updated? What elements of the weather are (not) included in forecasts?	"How do we find out about weather?" Display weather forecasts in various forms: Met Office, BBC, local and national news, looking out of the window, etc.	"Continuum of Accuracy": assess the relative accuracy of each source, based on criteria to be decided by the students with teacher support.
<i>Main activity</i> Introduce the kit. How does its data help us predict the weather? What is extreme weather and how do we see the signs?	Introduce the kit: what data it records and what each means. Compare St Jude's storm and the 2013 floods in Prague to live data. Find signs of extreme weather before it hits. Using live data, create a forecast for today, tomorrow and the week ahead. Are we in for extreme weather?	Weather station instructable Internet of School Things site: compare extreme weather to live weather: http://bit.ly/extremeexp "Information sheet: weather data and what it means" "Create a forecast"	Understand the key physical processes in weather and climate, and their interaction with people. Develop geographical skills in analysing and interpreting different data sources. Use numerical and quantitative skills, and communicate geographical information.
<i>Session close</i> How does extreme weather affect us?	Look at how St Jude's was reported in the mainstream media and on Twitter. Was the overall impact worthy of hype or sarcasm? How does weather (extreme or otherwise) affect different people in your community?	"#stormageddon" "Weather and your community"	Understand how the weather impacts on people's lives and how that relates to the environment.

Discussion

Does the UK have much extreme weather? How easy is it to predict the weather short/long term?

Further learning

It is the year 2040 and you are an employee at the insurance company Kay Os and Dee Zaster Ltd. Assess the likelihood of the following scenarios in the UK: drought or flooding, catastrophic snow storms, tidal waves and hurricanes or tornados.

Use these weather predictions for 2020, 2050 and 2080: <http://bbc.in/1e4Um9z>

How do we find out about weather?



**How can we find out what
the weather will be like in
our local area tomorrow?**

Continuum of Accuracy

Which of these do you think would be most likely to provide accurate forecasts? Cut out the cards and place them in an appropriate order. Discuss your choices.

BBC's Carol Kirkwood or ITV's Lucy Verasamy	Local farmer
Smartphone app	Local newspaper forecast
Local amateur with a weather station in their garden	John's weather stone
Weather centres in schools like rgsweather.com	The Met Office
Cows	Your science or geography teacher
An elderly neighbour	Weather sayings like "red sky at night"
Weather satellites	Your school weather station

Information sheet: weather data and what it means

Your weather station can record lots of different types of information. This sheet will help you understand how live data can help us predict what will happen in the future. Look at the data from St Jude's storm and the 2013 floods in Prague. Can you find signs of extreme weather before it hits?

Outdoor sensors

WIND SPEED increases as a storm strengthens and the air pressure drops. There may also be a drop in wind speed just before the arrival of rain: 'the calm before the storm'. Rapidly deepening low pressure systems lead to strong gales and damaging gusts.

WIND DIRECTION changes in two ways: it can back (turn anti-clockwise) or veer (turn clockwise). Changes in direction can indicate the approach of a cold front (often shown by veering winds). A southerly wind can often mean a storm is on the way, as air circulates anti-clockwise around a storm.

RAINFALL arrives with fronts, which are borders between warm and cold air. These are places where air is forced upwards, leading to condensation and rain. Clouds get lower and thicker as fronts approach. In winter rainfall may be replaced by snow. The general name for water moving from the atmosphere to the ground is precipitation.

TEMPERATURE drops when a cold front arrives and increases in what is called the warm sector (the area behind a warm front). Temperatures will therefore vary as a low-pressure system passes. They will also fall very low overnight in winter when high pressure is in place. Why not keep a record of temperature extremes near your school?

HUMIDITY is the amount of water vapour in the air. The total amount varies according to the temperature of the air: warm air can hold more vapour.

DEW POINT is the temperature at which moisture in the air condenses, and therefore clouds (and later, rainfall) start to form. This will vary with temperature. When dew point is reached near the ground, mist and fog can form.

Indoor sensors

TEMPERATURE, HUMIDITY and DEW POINT as above. BAROMETRIC PRESSURE drops as low pressure approaches, and gets higher in an anticyclone. Rapid drops are linked to the arrival of a front. If pressure stays high for a long time, the weather may be extremely hot in summer (and cold in winter). Low pressure is linked to wet and unsettled weather.

Other notes about forecasting

The arrival and passing of a cold front is usually marked at the surface by a rise in pressure, a fall in temperature and dew point, and a veer of wind. Rain occurs in an area within around 100km of the cold front. As a warm front starts to approach, the temperature and dew point within the cold air gradually rise, and pressure falls at an increasing rate. Precipitation usually occurs ahead of the front. The passing of the front is usually shown by the pressure staying stable, a sudden jump in temperature and dew point, a veering of the wind, and the end of the rainfall within a short time.

Heavy rain can lead to flooding, but there is often a delay between the rain falling and a river rising. This depends on where the rain actually falls along the course of a river, along with the size of the river itself. In a larger river, or where the rain falls in the upper part of the river's course, it may take several hours or even days for the river to start to rise. You can follow local river gauges on Twitter here: www.gaugemap.co.uk which would allow you to track the response of a local river after a period of heavy rain. The gauges can be embedded into a webpage, to allow you to tell the story of a river along its course.

Create a forecast

A cartoon weather forecaster in a suit and tie stands on a small platform, holding a microphone. He is pointing his right hand towards a large, rounded rectangular sign that says "Today". Above the sign are two rows of weather icons. The top row contains a cloud with a lightning bolt, a cloud with a heart, and a sun. The bottom row contains a cloud with a percentage sign, a cloud with three stars, and a sun partially covered by a cloud.

A cartoon weather forecaster in a suit and tie stands on a small platform, holding a microphone. He is pointing his right hand towards a large, rounded rectangular sign that says "Tomorrow". Above the sign are two rows of weather icons. The top row contains a cloud with a lightning bolt, a cloud with a heart, and a sun. The bottom row contains a cloud with a percentage sign, a cloud with three stars, and a sun partially covered by a cloud.

A cartoon weather forecaster in a suit and tie stands on a small platform, holding a microphone. He is pointing his right hand towards a large, rounded rectangular sign that says "Week ahead". Above the sign are two rows of weather icons. The top row contains a cloud with a lightning bolt, a cloud with a heart, and a sun. The bottom row contains a cloud with a percentage sign, a cloud with three stars, and a sun partially covered by a cloud.

#stormaggdon

The Telegraph

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St Jude Day's storm wreaks havoc across southern England

Two people have died, hundreds of thousands of homes have been left without power and rush-hour commuters suffered transport chaos as hurricane-force conditions battered Britain

theguardian

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UK death toll mounts as St Jude storm leaves trail of destruction

- Four dead as gale-force winds sweep southern Britain
- Falling trees kill two and two bodies found in London house
- Rail network grinds to a crawl as debris litters tracks

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At least 61,000 homes are still without power as Britain's starts to recover from chaos caused by the St Jude's storm

- In total 600,000 lost electricity because of hurricane-force gusts but ten per cent are waiting to be reconnected
- Majority of southern England had problems but Surrey, Sussex, Kent and Essex are the worst areas affected
- 17-year-old Bethany Freeman died after a tree fell onto the static home she was sleeping in at Hever, Kent
- Donal Drohan, 51, also killed in Watford, Hertfordshire, after his car was crushed during morning rush hour
- Gas explosion triggered after tree fell on a main kills man and woman at home in Hounslow, west London
- Transport chaos believed to be over with majority of rail firms resuming normal service this morning



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Anger at Gary Lineker's tasteless tweet: Football pundit and singer Lily Allen among stars making fun of deadly storm on Twitter

- Former footballer posts picture of leaf sitting on his car and makes joke
- Sports journalist Jake Humphrey makes fun of 'Stormaggdon on streets'
- Lily Allen says she is thankful for storm 'getting rid of neighbour's tree'

Weather and your community

Complete the table below: does weather matter to your community? How does day-to-day affect them? What about 'extreme' weather?

Job	How does weather affect them?	What about extreme weather?
Fire fighter		
Supermarket delivery driver		
Farmer		
Full-time parent		
Hot air balloon company		
Scaffolder		
Bouncy castle hire firm		
Teacher		
Train driver		

KS3 Geography Curriculum links

Key aims

All pupils are competent in the geographical skills needed to:

- > collect, analyse and communicate with a range of data gathered through experiences of fieldwork that deepen their understanding of geographical processes
- > interpret a range of sources of geographical information, including maps, diagrams, globes, aerial photographs and Geographical Information Systems (GIS)
- > communicate geographical information in a variety of ways, including through maps, numerical and quantitative skills and writing at length.

Key attainment targets

Pupils should:

- > develop greater competence in using geographical knowledge, approaches and concepts [such as models and theories] and geographical skills in analysing and interpreting different data sources. In this way pupils will continue to enrich their locational knowledge and spatial and environmental understanding
- > understand, through the use of detailed place-based exemplars at a variety of scales, the key processes in physical geography relating to weather and climate
- > understand how human and physical processes interact to influence and change landscapes, environments and the climate, and how human activity relies on effective functioning of natural systems.

Detail from KS3 Geography Curriculum (2013)

<http://bit.ly/1ALwa6C>

KS3 Computing Curriculum links

Key aims

All pupils:

- > can understand and apply the fundamental principles and concepts of computer science, including data representation
- > can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- > are responsible, competent, confident and creative users of information and communication technology.

Key attainment targets

Pupils should be taught to:

- > understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems
- > understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally
- > undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users
- > create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability.

Detail from KS3 Computing Curriculum (2013)

<http://bit.ly/1ffIM67>