PRIMARY GEOGRAPHY

Focus on weather and climate

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FORTHCOMING ISSUE

Autumn 2018: Responsive geography

EDITORIAL

PAULA OWENS

Guest editor, Paula Owens.

Weather fascination

Nearly 2000 years ago, ancient civilisations were using cloud formations, astronomical and meteorological events to make weather predictions. Today we have satellites to circle Earth and send back a vast array of data about wildfires, snow cover, sea-surface temperature, Earth and atmospheric radiation, aerosol detection and much more. While we still can't always predict the weather with 100% accuracy, we have come a long way towards a greater understanding of how weather and climate shape and impact our world and everyday lives. Significantly, we have also begun to understand how our everyday activities affect these processes.

The United Nations (UN) reports that: 'the greenhouse gas emissions from human activities are driving climate change and continue to rise. They are now at their highest levels in history. Without action, the world's average surface temperature is projected to rise over the 21st century and is likely to surpass 3 degrees Celsius this century' (UN, 2017). Weather and climate processes are more than just a fascination; rapid climate change is one of our greatest challenges and education has a key role to play.

Weather words

The word 'climate' comes from the Greek 'klima' meaning 'area' and usually refers to the long-term average of weather patterns (the World Meteorological Organisation's standard is a 30-year average) while 'weather' refers to conditions at a time and place. Extreme cold weather events do not mean global warming isn't happening; weather and climate work at different scales.

When teaching young pupils about weather and climate, we need to start with essentials. All weather and climate enquiries demand engagement with a vast and specialised vocabulary, hence a short glossary forms part of this issue of *Primary Geography*. The importance of 'weather words' is recognised by the Met Office, which has given names to storms (Met Office, 2017) and is even considering using regional slang in weather reports. This would most likely be welcomed by our guest interviewee, Robert Macfarlane, an advocate of the power of words to bring the natural world into focus and help us pay it more due. In *Landmarks*, Macfarlane (2016) gives us many regional descriptive terms for weather, including these two originating from Orkney: *Skreever*, 'a howling gale' and *Skuther*, 'a short, sharp breeze'. Both terms conjure up a goose-bump chill and invite the geographer in us to reflect on the connections between place, location, weather and words.

Teaching with hope in mind

At the time of editing, the news is full of weather and climate anomalies across the world: snow in Florida and the Sahara; heatwaves in Australia, and drought in Capetown. More than 40 million people in Bangladesh, India and Nepal were affected by flooding in 2017. The World Meteorological Organisation (WMO) recently announced that: 'In a clear sign of continuing long-term climate change caused by increasing atmospheric concentrations of greenhouse gases, 2015, 2016 and 2017 have been confirmed as the three warmest years on record' (WMO, 2018). Geography helps us teach carefully about extreme weather events that might otherwise be frightening for young pupils.

Even very young pupils are aware of the terms 'climate change' or 'global warming', and possibly frightened by it; their fear fuelled by misconceptions. As most schools already have a range of environmental practices in place, such as recycling and energy monitoring, it makes sense that pupils should have misconceptions challenged, engage with relevant knowledge and skills and be encouraged to be critical, rather than compliant, thinkers.

These are powerful reasons why we as educators need to not only teach the basics of weather and climate but also engage pupils with the power they hold to make informed choices, with possible, probable and preferred futures in mind (see Hicks, 2017). The range of approaches illustrated in this issue of *Primary Geography* hopefully does just that.

Acknowledgements

Thanks to all contributors, to the *Primary Geography* Editorial Board for their expertise and support, to Oliver, Harvey and Lola for asking such good questions of our interviewee, and to Lola in particular for being a willing weather girl.

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WEB RESOURCES

Download ideas for using the cover of PG: *www.geography.org.uk/pg*

The START gallery

READING THE WEATHER

JANE WHITTLE

Jane presents a range of activities to help pupils explore weather concepts through fictional texts.

Stories open up new ideas about the world, but while pupils are often innately curious about weather processes, the geography behind these processes can be challenging. However, 'well-chosen books have a powerful impact in the classroom, they can engage pupils' interest, excite curiosity, provoke questions, pose dilemmas and spark imaginative responses' (Tanner and Whittle, 2013), and Sam Usher's books, *Snow* (2014), *Rain* (2016) and *Sun* (2017) provide an exciting combination of fiction and real-world geography. You can use the following geographical activities to encourage different year groups to explore the weather in Usher's stories (or others, see web panel).

Preparing for weather

In each of Usher's books, the boy must collect provisions for his adventures outdoors. Ask pupils to focus on this aspect of the stories and make a list of what the boy needs to prepare for each type of weather. An extension would be to ask the pupils why they think the boy needs each item, helping them to develop mindfulness towards how to stay safe.

Discussing the weather

Many questions could stem from reading the stories, including: why is the weather different in the same location? The boy is excited to have adventures in the different weather, how do weather and feelings connect? Why do you think the boy wants to be the first person to walk in the snow? When the author uses the phrase 'the sun beat down', what does it mean? What words and phrases do we use to describe the weather? Where does the snow and rain go after the story? Find the comparatives in *Sun* (Usher, 2017); ask what other comparatives can you think of to describe the weather? What different activities does the boy carry out in different weather?

Sam Usher's books, including *Sun* (2017), provide an exciting combination of fiction and real-world geography. Photo © Jane Whittle.

Turn fiction into non-fiction

As Pike (2016) states, 'geography always links with language, as geographers need to access many different types of information in their geography enquiries'. Pupils could write a non-fiction book to accompany the stories; encourage them to include a glossary (see pages 28-31 for an example) to ensure that they incorporate the correct vocabulary. In *Snow* (Usher, 2014) the boy says 'I hope it snows again tomorrow'. After exploring weather signs and symbols, pupils could create a weather forecast map to accompany this story.

Expand the story

While Usher's text goes into detail about the weather, much information is also conveyed through the intricate illustrations. Stopping at each one and asking pupils to expand the story will encourage them to study the illustrations and use their prior knowledge. Pupils could create their own storybook for other types of weather (e.g. Fog, Storm), but they will need to research the weather type to ensure their character's adventures are accurate.

Point of view

Pupils could rewrite one of the stories from the point of view of the weather system or from an animal in the story. Pupils might like to discuss the adventures they plan to include and may have examples of their own adventures to share. Giving them time to talk about weather adventures will help pupils to foster personal connections.

Explore the sky

Each book has pages that focus on the sky. Pupils could compare and contrast how the sky transforms depending on the weather and think about the colours of the sky and the different cloud formations. This is a wonderful opportunity to create weather colour wheels.

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Pike, S. (2016) *Learning Primary Geography: Ideas and inspiration from classrooms*. Abingdon: Routledge.

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Usher, S. (2014) *Snow*. London: Templar Publishing.

Usher, S. (2016) *Rain*. London: Templar Publishing.

Usher, S. (2017) *Sun*. London: Templar Publishing.

WEB RESOURCES

Download a list of other suitable weather books: *www.geography.org.uk/pg*

Jane Whittle is PYP Co-ordinator at the International School of Como, Italy. She is the co-author of 'Back2Front: The Americas' and a member of the Primary Geography Editorial Board and the GA's Early Years and Primary Phase Committee.

EXTREME WEATHER

STEPHEN SCOFFHAM

Here, Stephen explores how finding out about how extreme weather impacts on people's lives can fire pupils' imaginations. The examples he selects focus on, and provide a natural opportunity to develop, UK locational knowledge. However, because extreme weather affects the whole planet, this cross-curricular topic could be given an international flavour.

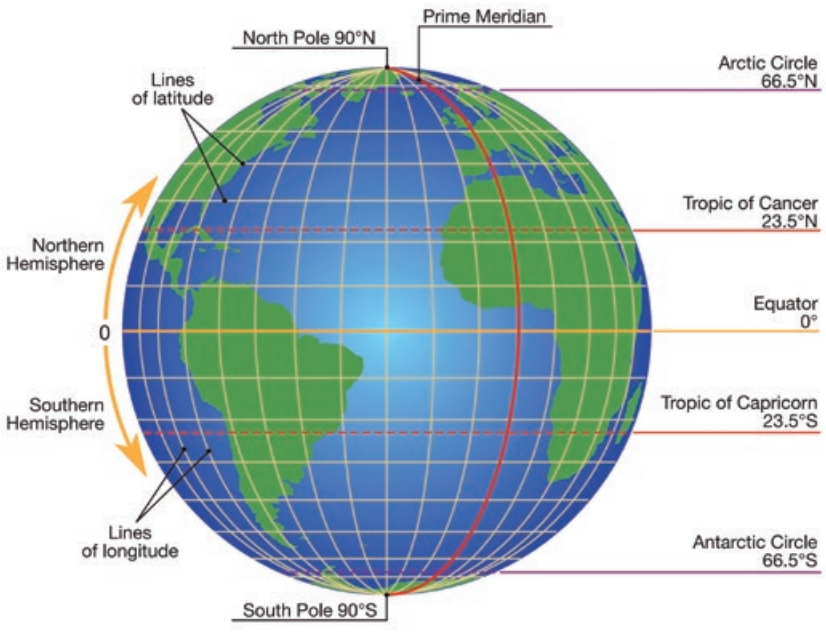
A short distance from where I live there is a hamlet called Knowlton. It is a tiny place, consisting of an old manor house, a church and a few houses. Although there is not much to see in the way of buildings, Knowlton has a place in English history. Inside Knowlton Church is a memorial to Sir Cloudesley Shovell, who has the unenviable reputation of being in charge of the English Fleet when it ran aground in a storm off the Isles of Scilly in 1707. It is believed that the reason for this terrible naval disaster, which cost 2000 lives, is that Sir Cloudesley was unable to ascertain his longitude. It would be many decades before the invention of an accurate maritime clock would enable sailors to establish the difference between Greenwich Mean Time and local solar time thereby solving the problem. Nevertheless, the 1707 disaster certainly spurred the quest for a solution and it is just one fascinating example of how geography, meteorology and science interlink (Figure 1).

Britain has always been affected by extreme weather events. Finding out about them and the different way that people have responded makes a fascinating story. You may not live near a village like Knowlton, but there are likely to be older people in your area who will share their memories. Some may remember the terrible winter of 1947, when there were snowdrifts 5m deep on the Pennines and three months of frost and ice across the country. Then there was the smog of 1952 when the air in London was so thick with fumes that pedestrians lost their way and, in some places, people were unable to see their feet. A year later, in 1953, more than 300 people drowned in the floods that engulfed the east coast of England, from Lincolnshire to Kent. The photographs taken at the time show the scale of the devastation. The event was also commemorated in artwork and tapestries (see Figure 2).

These are historical events, but there are also more modern ones. For example, some teachers will be able to give first-hand accounts of the great storm (sometimes wrongly called a hurricane) that brought winds of over 160kph (100mph) to south-east England in 1987, uprooting 15 million trees in the process. In the present century, the summer of 2003 brought the highest temperatures ever recorded to many parts of Britain and led to thousands of premature deaths. A prolonged period of very low rainfall from 2010 to 2012 caused extensive damage to crops and resulted in hosepipe bans.

In recent years floods and strong winds have been a particular concern. For example, the winter of 2013–14 brought a sequence of storms that flooded areas such as the Somerset Levels for several months. It also led to cliff falls in south Devon, which destroyed the railway line at Dawlish and cut off rail services to Cornwall for many months. In winter 2015–16, prolonged rainfall in northern England caused the rivers Tees and Eden to burst their banks, flooding Carlisle and sweeping away bridges (see Hatwood, page 14 for another example). Advance warning of an approaching storm can help people take precautions against severe weather, and the UK Met Office has now begun naming such storms – a method that seems to better alert the public.

Pupils enjoy finding out about extreme weather events and the havoc that they have caused in the past. Plenty of information is available via the internet, and old photographs and newspaper reports do much to capture the urgency that people felt at the time (see web panel). You can explore the different responses through role play and drama, and opportunities for writing in different modes and registers is immediately apparent. Such studies are an engaging and motivating way to introduce a topic



As Earth spins on its axis, it completes a full revolution (or 360 degrees) every 24 hours. Therefore, Earth turns through 15 degrees for every hour. Greenwich Mean Time starts at the Prime Meridian, which passes through Greenwich, London. Places where local solar time is one hour different from Greenwich Mean Time will therefore be 15 degrees away. The longitude of other places can be calculated in exactly the same way.

Figure 1: How time is used to measure longitude.

Figure 2: The 1953 flooding commemorated in a tapestry. Photo © Stephen Scoffham.

on extreme weather, but they are only a starting point. The following suggestions can help you go further.

Heat waves, droughts and storms

Ask the pupils to select a single past weather event to study in detail. As part of their investigation they should draw or download maps to show the areas affected. They should include statistics about the temperature, wind and precipitation and so forth. Challenging them to explain what caused the event they are studying will lead naturally into a discussion about possible prevention measures.

Recording local weather events

Keeping local weather records usually appeals to pupils, but extreme weather events certainly add interest. Get pupils to measure exactly how hot, cold or wet it has been as a result of specific event. Ask them to talk about how they feel about the weather they have just experienced. Have other areas of the country been equally affected? Thunderstorms are liable to fire their imagination, but remind them that not all weather phenomena are violent or damaging: the rainbows, dramatic sunsets and unusual cloud formations that attract our attention are also ideal for celebrating through art and music.

Weather memories

Arrange for the pupils to talk to local residents about their memories of extreme weather events and to ask about how they affected the residents – you could contact a local Old People's Home or the Warden in charge of sheltered housing. As well as contributing to an oral history project, the pupils can compile all of the accounts into a short video presentation to share with those people who participated.

- In the summer, a heatwave named Lucifer hit southern Europe. In some places temperatures rose above 40°C and eleven countries issued 'danger' warnings.
- On 22 August, after heavy rainfall upstream in the north of the country and in India, more than one-third of Bangladesh became submerged. It is estimated that 3.9 million people and more than 500,000 were affected by the floods, which were thought to be the most severe in 100 years.
- In early September, Hurricane Irma left a trail of destruction across the Caribbean. The Category 5 hurricane brought with it 300kmph winds, which destroyed nearly every building on the island of Barbuda where Irma first made landfall.
- On 21 October, 250 the North California wildfires – made worse by the tinder-dry conditions – burned across nearly 100ha of land and destroyed 8900 buildings.

Figure 3: Three months of extreme weather across the world in 2017.

Worst weather

Divide the pupils into groups and ask each one to research a different type of extreme weather. The groups' task is to convince the rest of the class that their particular type of weather is the 'worst'. Give this activity an international flavour by including events elsewhere in the world (e.g. bush fires in Australia, dust storms in Beijing, the 'haze' that engulfed Singapore in 2015; see Figure 3 and web panel).

Freak storms and floods

Some extreme weather events are either highly unusual or affect only a very small area. The tornado that swept through Birmingham in 2005, for example, carved a 1km-long path through the city but left other areas unscathed. Similarly, the 2004 floods in Boscastle and Crackington Haven in Cornwall were the result of a localised storm, and villages elsewhere on the coast were spared. Get the pupils to investigate different freak weather events: gales, lightning and hailstorms are good starting points.

Individual events tell us very little about long-term trends, but questions that keep cropping up concern the impact and frequency of extreme weather events. 'Are storms more violent now than in the past?', 'Are winters getting warmer?' and 'Is flooding getting worse?' While there can be no precise answers, we know that global temperatures have risen by approximately 1°C from pre-Industrial levels, which means there is more energy in the global climate system. Increasingly violent and unpredictable weather seems likely. Rather strangely, if ocean currents are disrupted, global warming might bring lower rather than higher temperatures to the UK for a while. Whatever happens, we need to fasten our safety belts for uncertain weather in the future.

WEB RESOURCES

Past weather events in the UK: *www.metoffice.gov.uk/climate/uk/interesting#y2017*
Ten Worst Weather events: *www.bbc.co.uk/timelines/zcwj2hv*
The Conversation on extreme weather events worldwide: *https://theconversation.com/2017-the-year-in-extreme-weather-88765*
UK mapped data for 300 UK climate stations: *www.metoffice.gov.uk/public/weather/climate/u10unds1y*

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WRITING THE FLOOD

GORDON MACLELLAN

Here Gordon describes how he helped year 5 and 6 pupils to make sense of a local, destructive, weather event and to create a lasting memory of the event in their own words.

The flood

Winter night, winter water,
Christmas night,
The river wakes.
The flood is coming.*

It rained. For a month, a week and one day, it rained. On Christmas Eve 2015, when the ground was saturated, the watershed at capacity, every overspill topped, everywhere soaked and all escape routes taken, the River Calder went for a walk across its floodplain. The floods were dramatic: shopping streets in Todmorden and Hebden Bridge became rivers; the delightful small shops of Hebden's Market Street were inundated; the roads, paths, home and gardens swamped. Further downstream at Elland, the river cracked the bridge (Figure 1) and closed the road to the primary school.

An elephant stampede,
Plunging down, plunging onwards
Towards the town, towards the bridge,
Toward the bridge that
Will crumble like Weetabix.

Figure 1: The strength of the flood cracked the bridge at Elland. Photo © Canal and River Trust.

One year on

A year later the road was restored, the bridge repaired and ready for opening (and, with it, easy access to Elland Primary School renewed) and I was brought in. As Creeping Toad, I work with groups and schools to find ways to celebrate the places where people live, work and play. I tell stories, devise puppet plays, build and shape things, play with celebration: essentially, I give people opportunities to reflect on how they feel about the world around them, offering them ways to express those feelings. With this project, my role for the Canal and River Trust (see web panel) was to work with pupils from Elland Primary School. The idea was to capture their experience of the floods and generate some words and phrases that could be carved into the arches of the new bridge. Here, I offer the sequence of activities we used to explore the pupils' experiences as a possible model for you to carry out similar work.

We began almost a year to the day after the rains started in 2015, and found that the flood was already the stuff of urban legends for our young artists. Some of the pupils had been there; some had seen the river crack the bridge; everyone (thought they) had seen the river in flood. Many pupils had their journey time to school doubled because detours were needed to cross the river. However, they found it hard to remember those moments clearly: 'the river threw a boat against the bridge. I know. I saw it!', 'Oh, no, the boat went right over the bridge and was left in a tree' and 'Wasn't it a cow that was left in the tree?'.

This river is waking.
The river is a volcano ready to erupt,
Murky water stirs,
Turns, rises,
Angry water, kicking the rocks,
Wild as a bull,
Cracking rocks into pieces.

Remembering the experience

Given the tenuous memories mentioned above, we could have done with asking pupils to bring in photos of the floods. However, we had a set of generic photos of rivers and floods, which we took time to talk about, to nudge and to invite recollection. We recorded their memories of those dramatic flood days, encouraging words and pictures, censoring and editing nothing, just getting the pupils to share.

We looked for stages in the run up to the destruction of the bridge: the wet winter, the floods at Christmas, watching the water. We used questions to keep ideas moving about the consequences of the flood 'how did what happened afterwards affect the pupils?' and 'what might happen when the bridge reopened? Interestingly, most pupils who came in cars in journeys 10 minutes long the year previously, which now took 30 minutes, did not seem to recall the shorter journey. This was, perhaps, a reflection on how little attention the pupils pay to the world beyond the family car.

Recommendation: visual aids help us to remember

Curriculum links: talk about river features (literacy – spoken word opportunities), look at overall structure (design – building a river using pictures), water control and settlements along rivers (science and geography).

Imagery

We played with the collected memories: drawing moments with oil pastels on large sheets of paper and adding words to convey movement and emotion. Pupils were encouraged to think from the river's perspective as well as human ones: how did the river feel? Did it feel as angry as it looked? We added starting points for metaphor and simile (Figure 2): describing the river or the scene they were working with as… an animal, a machine, a piece of furniture, a time of day, a sort of weather, a person, something from the kitchen, and so on.

Flooding playgrounds,
The river roars loud as a tiger,
A stampede of elephants.
A rumbling avalanche,
But
Fish swim between swings
Calm water reflects a slide,
No pupils play here now.

Recommendation: allow time for talk

Curriculum links: link to literacy (similes, metaphors and alliteration, and excellent spoken word opportunities) and PHSE (empathy and appreciating action from other perspectives).

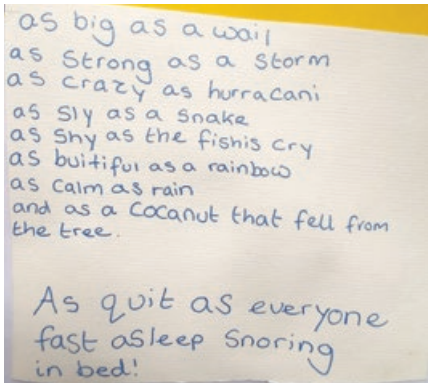


Figure 2: Describing the river featured opportunities for similes, metaphors and alliteration. Photo © Gordon Maclellan.

The flooding river doesn't stop,
A hammer to batter the bridge,
Lifting boats, crashing boats,
A bonfire out of control.
This river is racing, a cheetah after its prey,
An unsettled blender, turning and churning,
People are scared and stuck, frightened.

Walk away, do other things

We left words to settle, to simmer and stew. We made individual pop-ups of river scenes (Figure 3) of bridges (cracked and whole), boats being swept away, and pupils being rescued from rising waters (none were, but many wished they had been).

Recommendation: do something related but different to allow time for words to brew

Curriculum links: design, 2- and 3-D construction; different ways of approaching literacy – draw and build before writing

Things to hold

Pieces of shaped stones taken from the 300-year-old bridge were provided for the pupils to explore. They showed mason's marks and pupils liked the connection: they were able to hold something connected to people long gone, but which those people had seen, knew and touched themselves.

Recommendation: to watch how a fish swims or a freshwater shrimp wriggles helps not only with pupils' descriptions, but also offers them an appreciation of how difficult life would be for aquatic species in, for example, a flood. Take a river-dipping trip or have an aquarium of animals in class for a day

Curriculum links: science – animal diversity and adaptation to different habitats; history – human stories, local history; geography – rocks associated with your river.

Wider context

There was not enough time to look at the context of the 2015 floods. Although we talked as ideas developed, a longer project would have enabled us to use weather reports and satellite images to track the storms. We could also have looked at the rest of the country over the same time period to discover if this storm was part of a larger pattern or if it just seemed like a vindictive assault on Yorkshire. It would also have offered the ideal opportunity to make links to climate change with questioning such as: 'was this a one-off situation or had it happened before?', 'might this kind of flooding happen again?' and 'what provoked such rain and floods?' We did manage to discuss flood mitigation and balances between cause and symptom.

Recommendation: tap into wider resources, set time aside for discussion

Curriculum links: geography and science – weather patterns, local weather in a global context, how people respond to natural crises, possible implications of global warning

Come back to the words

We then picked up our words again and worked in groups looking at earlier ideas, speaking words aloud, performing some sections – and from this, we edited our poems.

Recommendation: circulate the group poems around for other groups to edit to try to avoid pupils' protectiveness of their own words. Use the phrases that get edited out elsewhere, possibly to build personal lines into pop-ups

Curriculum links: literacy – draw the activities together as performance poetry or drama to ensure pupil understanding of a whole process

Outcome

We gave the Canal and River Trust the whole of our narrative poems for them to choose lines to decorate the new bridge with. But they didn't, they used whole poems, running the words, like water, under and through the arches of the new bridge over the River Calder at Elland.

And now, and now, and now,
Calm as a sleeping baby,
Peaceful now
But never quite as peaceful again,
Simmering,
Always ready to roar.

*Note: All the quoted lines are taken from poems produced during the project by pupils in years 5 and 6 of Elland Church of England Primary School, West Yorkshire, in 2016/17.

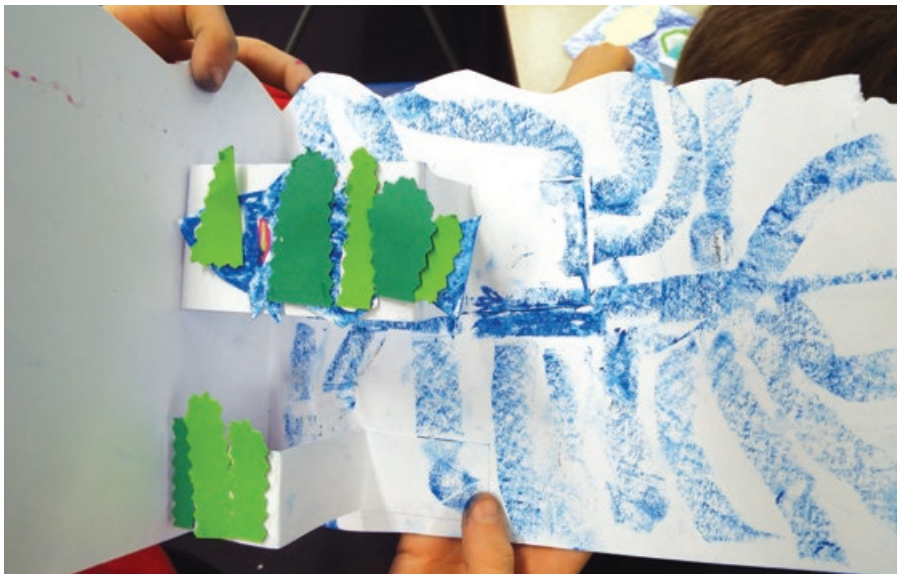


Figure 3: Our pop-up river scenes were created using simple folded card with bracket supports.

WEB RESOURCES

Calder Future: *http://calderfuture.org.uk/*
Canal and River Trust: *https://canalrivertrust.org.uk/*
Creeping Toad blog: *http://creepingtoad.blogspot.co.uk*

Gordon Maclellan trained in terrestrial ecology and teaching, and now works (with Steve Brown) as the storyteller and artist, Creeping Toad. Gordon's work revolves around finding creative ways to help people explore the relationships between people, places and wildlife.

WILD WEATHER!

LAUREN CAMPBELL

Lauren explains how she let geography, and her pupils, lead the way on an exciting weather project that infected the wider curriculum with purpose and excitement.

Introduction

Having studied geography at Edinburgh University as an undergraduate, it remained at my core when I moved into primary teaching. I always try to find exciting ways to include geography in my teaching practice and, considering the subject is so diverse and multi-faceted, it is not difficult. I am fortunate that my school actively encourages creative cross-curricular learning, so it is often a building-block in my theme.

Stimulating interest

Last year, as an NQT, I taught a year 3 class. At the end of the school day we often watched CBBC Newsround, which is a valuable resource for stimulating geographical discussion in itself. The pupils found the weather reports fascinating, especially when extreme weather occurred elsewhere in the world. They frequently asked questions such as 'How does that hurricane do that?', 'What do people use all that extra rain that falls for?', 'Why does the temperature change?' and 'How do you know if a storm is coming?' As we know, the best type of learning occurs when it is led by pupils' passions and interests, thus our 'Wild Weather' learning theme was born.

Figure 1: The pupils decided this was the best place in the school grounds to site their weather station. Photo © Lauren Campbell.

Getting started

I shared our theme with the Science co-ordinator, who sourced us an electric weather data logger and weather station. The pupils decided the best place to put the weather station was outside the classroom high on a section of gate (Figure 1). We set up the logger screen in the classroom in order to share the data on a daily basis. The pupils were captivated: every morning there would be a rush to check the weather vane and data logger. The pupils recorded the data and compared it over a series of days.

I created a weather reporters' area of the classroom where the pupils could make their recordings and added some charts on cloud type and cover. I placed one thermometer in the classroom and attached another to the wall just outside the classroom, which enabled the pupils to make comparisons. The pupils read scales, plotted graphs and made predictions; what had started as a geography-based project began to involve both maths and science.

Weather wondering

While comparing the temperatures from the weather station with our own thermometer in the classroom, the pupils noticed that different temperatures were recorded. This discrepancy really interested the pupils and gave rise to questions on the location of the weather vane including 'Was the nearby tree in fact impacting our recordings?' and 'Was the station sheltered from the wind and rain?' This interest then extended to their recordings of wind speed and direction. The pupils spotted the weather vane on top of the school and used that to compare wind direction. The questioning continued, with pupils discussing whether the height of the vane had any impact on the direction shown. It was wonderful to hear their daily use of geographical language in the classroom.

Curriculum links

The interest the pupils were taking in the weather topic was palpable; it crept into areas of the curriculum that I had not anticipated. For example, in science we had been growing vegetables but were due to go on half-term. Some pupils became concerned about how the plants would be watered when people went away for long periods. (They tried to convince me to water the plants every day during the holiday; despite their best efforts I resisted.) However, one of my SEN

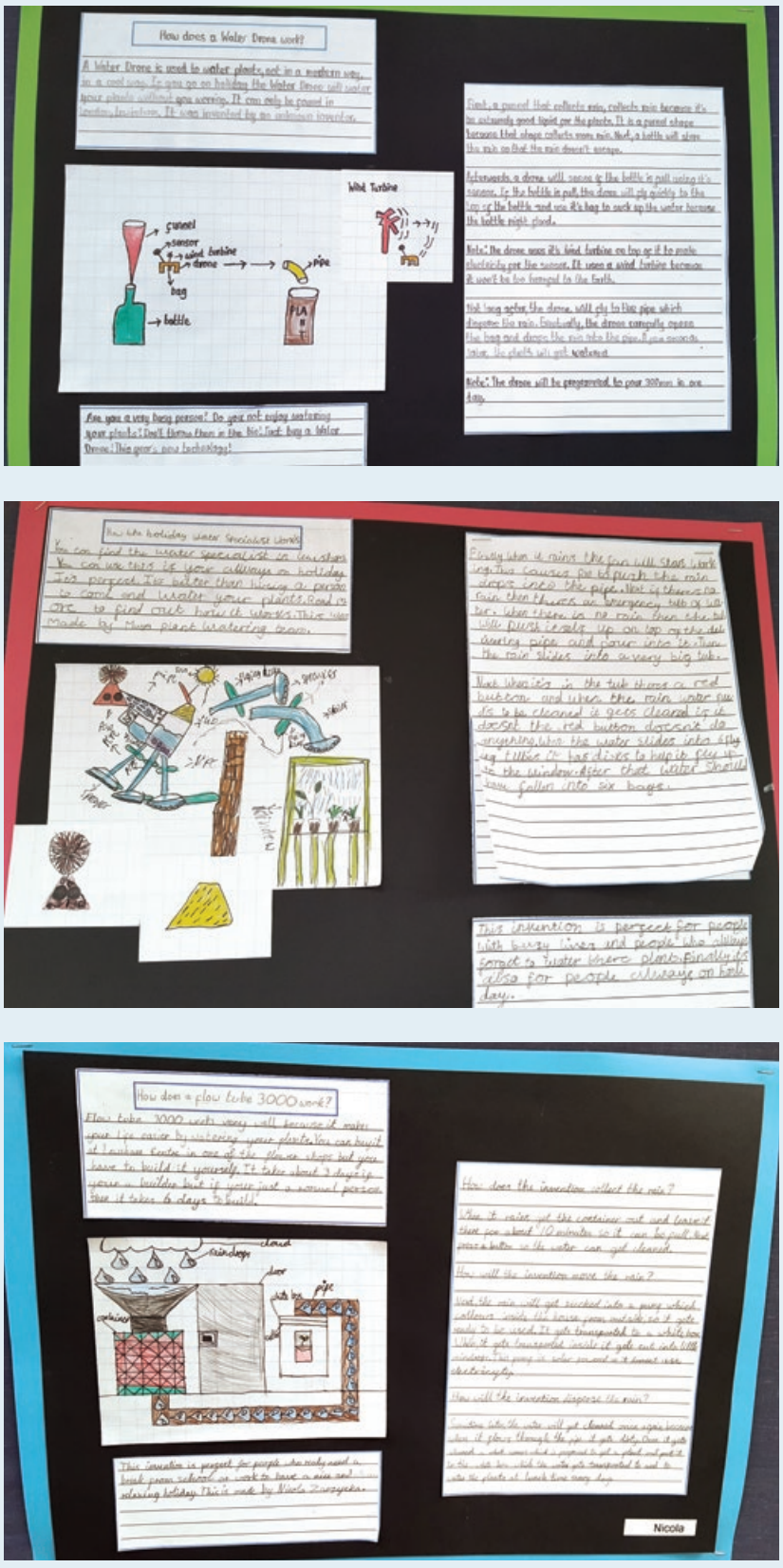


Figure 2: Pupils designed their own rain-harnessing inventions and wrote explanatory texts on how they work. Photos © Lauren Campbell.

pupils suggested that we should put the plants outside and let the rain water them. This idea immediately stimulated discussion and a project for the pupils to design their own rain harnessing inventions. We also tied this into literacy learning with pupils writing explanations of how their designs worked (Figure 2). The pupils' designs opened up discussion on the principles of renewable energy – another interesting aspect related to weather that I had not anticipated focusing on (see Green, pages 20-1).

Dancing the weather

The cross-curricular links extended further when my class was invited to take part in a dance competition for schools in south London. As any dance style and theme was acceptable, my pupils wanted to incorporate their weather learning into the dance, so we decided to do a 'Storm dance' (Figure 3). The excitement was palpable: even the most reluctant and least confident dancers in the class got on board. We spent time reviewing different weather systems videos (see web panel) and deciding how these could be conveyed through dance in terms of shape, pace and movement. The geographical learning really came through when pupils made suggestions such as 'We could twist our bodies to show the hurricane', 'You could be still in the middle of the group to show you are the eye of the storm' and 'We could go quicker at this point to show the speed of the wind as it changes direction'. The rehearsal process and performance were a huge success.

Figure 3: The pupils chose to incorporate their weather learning into the dance. Photo © Lauren Campbell.

Leading with geography

I am committed to using geographical themes with my pupils, and the topic of 'Wild Weather' allowed them to lead their own learning. This personalised learning is very effective in that it encourages high levels of pupil engagement and extension. The theme also supported my belief that geography can be incorporated across the curriculum, and I look forward to leading with the subject again.

WEB RESOURCES

BBC Wild Weather video: *www.bbc.co.uk/programmes/b04tqbxc*

RSPB Wild Weather: *www.rspb.org.uk/fun-and-learning/for-families/family-wild-challenge/activities/wild-weather/*

Wild Weather poster download: *www.open.edu/openlearn/nature-environment/order-your-free-wild-weather-poster*

Now in her second year in post, Lauren Campbell currently teaches a year 2 class at Brindishe Manor Primary School, London, UK.

WEATHER AND CLIMATE IN THE CURRICULUM

JENNIFER THORPE

Jennifer explains how her passion for teaching about weather and climate led her to develop an extended unit of work with fieldwork opportunities and data collection built in.

Introduction

I am a year 4 class teacher and the geography co-ordinator at Burlington Junior School in New Malden, Greater London. At university, I studied geography as an undergraduate, and climate and meteorology for my Masters because I am passionate about these subjects. In this article I demonstrate the merits for including weather and climate in primary geography in ways that go beyond National Curriculum expectations.

Most people are interested in the weather because it forms part of our everyday experience. I follow the weather forecast religiously on television, radio and my mobile phone. It is topical: giving primary school pupils a background in climate and weather will allow them to follow current events, such as hurricanes and climate change, with greater understanding. Here, I provide ideas about how to plan a topic on weather and climate; indicating how rewarding the topic is when practical aspects are added and geography is meaningfully linked to other subject areas.

Planning the weather

Given the opportunity to update our school's geography plans, I could not resist adding an extended, practical, weather and climate topic into the curriculum. The weather is part of pupils' everyday life, so it is easy to access and engage them through fieldwork. Weather and climates lend themselves nicely to working at different scales, including collecting weather data at a local level and learning about climate zones and biomes at a global level (Figure 1).

Introducing the topic in year 4 will allow pupils to apply their knowledge of weather and climate to topics covered in later years. It also complements other subjects in the year 4 curriculum including 'States of matter' in science (when pupils look at the water cycle)

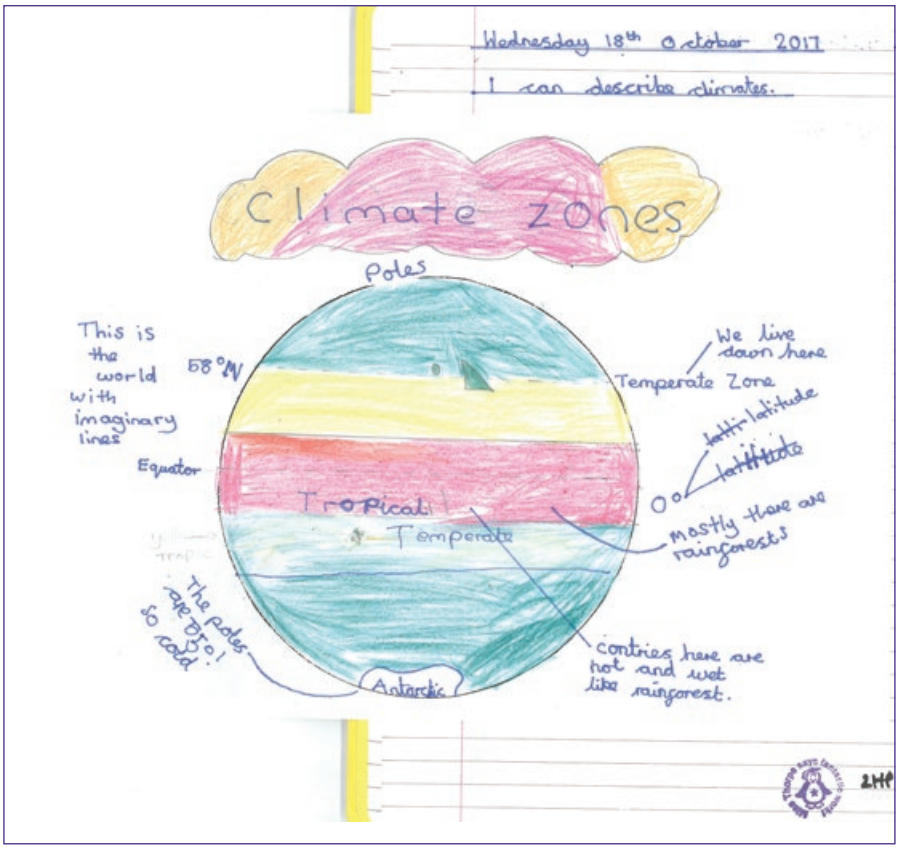


Figure 1: A weather and climate topic can extend from investigating weather at a local scale to learning about climate zones at a global scale.

and 'Measurement' in maths. The primary maths curriculum specifies that pupils use measuring instruments with accuracy and make connections between measure and number; thus, weather provides an ideal context.

Timing and skills

Teaching the topic in the first (September) term coincides with the hurricane season in the Atlantic, and our lesson on wind speed (Figure 2) coincided with Hurricane Irma (Figure 3) making landfall (when a storm moves over land after being over water), meaning the knowledge learned was particularly topical.

The best thing about this topic, however, is that it allows teachers to cover many of the skill requirements of the key stage 2 curriculum. We used interactive Earth Wind maps (see web panel) to track Hurricane Irma, the playground compass to measure wind direction, a map of the UK as part of a weather forecast presentation, and globes and atlases to locate countries

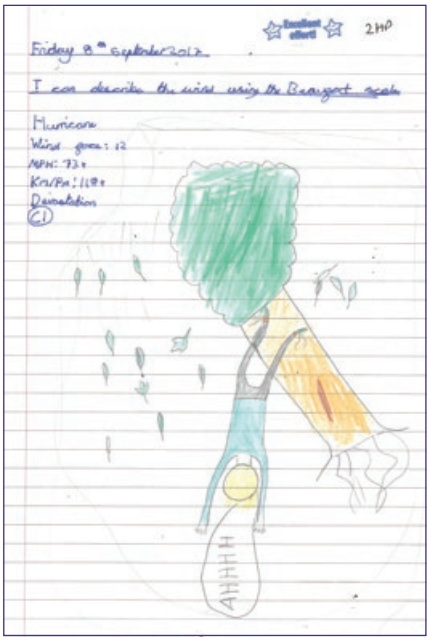


Figure 2: Our lesson on wind speed and the Beaufort Scale coincided with Hurricane Irma making the news, providing a topical reference for pupils' learning.

Figure 3: The eye of Hurricane Irma is clearly visible from the International Space Station as it orbited over this Category 5 storm on 5 September 2017. Image © NASA.

in different climate zones and biomes. The most fruitful aspect of this topic was the opportunity for fieldwork: the first three lessons included time spent outside the classroom collecting weather data.

Practical fieldwork

We borrowed instruments from the Royal Meteorological Society for free. These included a digital anemometer, digital infrared thermometers, a rain gauge and two USB temperature data loggers. The pupils enjoyed using the infrared thermometers to zap objects in different locations around the school. Some pupils worked out that they could measure the temperature of clouds and became very excited by the cold temperatures they were able to record. We also made our own Okta grids to measure cloud cover (Figure 4).

To complement the topic, we organised a trip to Kew Gardens. The pupils measured the soil temperature, light, air temperature and humidity in the gardens at Kew (as a temperate climate) and compared the results with similar measurements taken inside the Palm house (a Victorian glasshouse, which represented a tropical climate). The pupils also took the opportunity to observe and draw conclusions based on these 'climate zones'.

Figure 4: The pupils made their own Okta grids to measure cloud cover. Photo © Jennifer Thorpe.

'I enjoyed it when we used paper to make an Okta grid.' (Daniel)

'I enjoyed the different things we tried to use to tell the weather.' (Luana)

'I liked using the weather instruments.' (Amelie)

'We learned about climate and how few people live in the desert or polar zones.' (Sebastian)

'I enjoyed going to Kew Gardens because we used some of their equipment and we played a game inside the greenhouse.' (Akshaya)

'I learnt that at the top of the world the temperature could be minus 55 degrees Celsius.' (Friday)

'I enjoyed doing a weather presentation.' (Friday)

'I learnt that if you suck your finger and stick it up in the air it will tell you what way the wind is blowing.' (Minal)

Figure 5: A sample of pupil feedback on the weather and climate topic.

What next?

I conducted a survey to find out what aspects they enjoyed and were most memorable for the pupils (Figure 5). Next year, I will make various improvements to the planning and will use an enquiry question to drive the weather and climate topic, such as: 'Why is it always raining in New Malden?' or 'How is the weather in New Malden different from the rest of the world?' I am aware that using a question that relates to the pupils' home area should help engage them further. We can spend the first lesson discussing how the pupils can go about answering this key question. Subsequent lessons can be linked to questions that support this investigative approach (e.g. 'How can we measure different aspects of the weather in New Malden?', 'How much precipitation do we get in New Malden?' and 'What would it be like to live in Svalbard?').

Practicalities

Lots of resources are available to support a topic in weather and climate – from computer software to loans of recording instruments. The Royal Meteorological Society has lots of ideas about how to make your own instruments, including a pine cone weather station (see web panel). You could set up a weather station in your school grounds and a 'Weather and climate club' to encourage budding meteorologists to collect and analyse data (but this can cost upwards of £1000).

Weather and climate is a topic that is inherently scientific, geographical and mathematical and one that pupils will easily engage with, because it is so relevant and topical. This makes the topic an excellent addition to any primary school's curriculum.

WEB RESOURCES

Earth Wind maps in real time: *https://earth.nullschool.net/*
Instrument loans: *www.metlink.org/observations-and-data/instruments/*
Measuring Cloud Cover resources: *www.metlink.org/wp-content/uploads/2013/11/science_weather/clouds_resources.pdf*
BBC News report Hurricane Irma: *www.bbc.co.uk/news/world-latin-america-41172545*
Weather stations: *http://weatherstations.lgfl.org.uk/*

Jennifer Thorpe is a Primary School Teacher and the Geography Co-ordinator. Her undergraduate degree dissertation was published in the 'International Journal of Climatology' in 2006, and her Master's dissertation in Applied Meteorology and Climatology was published in 'Theoretical and Applied Climatology' in 2007.

REACTING TO THE WEATHER

RICHARD HATWOOD

In this article Richard explores how we can use topical weather events to teach pupils both how physical processes work and how humans respond to such events.

Introduction

I deliberately waited until I was sitting in The Lodge at Port Howard in the Falkland Islands to write this article. On the bus from the airport to Stanley, the capital, a child had said to me, 'you can experience each of the seasons in a single day on the Falklands!' This made me to think it was the perfect location to write an article on weather.

Weather interested me as a pupil in school and this interest continued when I became a teacher. I have found that by using the weather we can teach pupils not only how physical processes work, but also how humans respond to them. The recent (September 2017) Hurricane Irma was a perfect example of this; it showed clearly the link between human and physical geography.

In the news

Coming into school over the days after the hurricane emerged; the pupils talked about it. Irma had been in the newspapers, on the television news and on the internet: it was a hot topic. In fact, Hurricane Irma caught the attention of my pupils more than other natural disasters we had explored. I came to two conclusions as to why: the hurricane had affected British Overseas Territories (and the pupils were keen to find out about them) and the storm was unfolding right in front of them. This was not something that had happened five or ten years ago, it had happened last week and they were reacting now. In Wales, the National Curriculum for Geography (see web panel) notes that pupils must carry out investigations of 'geography in the news', topical events and issues in the local area and the wider world. The work I planned linked perfectly with this requirement.

Human and physical

It was essential to find a starting point that would help provide structure when learning about the weather. We could choose from myriad video clips on the internet and in the news. We began by breaking the reports on Hurricane Irma down into 'physical' and 'human' activities and impacts. The pupils worked in groups using newspapers, online sources and their own understanding to note the things that could be classed as 'physical' (the hurricane itself, flooding and wind) from the 'human' (electricity supplies down, roads breaking up and airports closing). From this, we worked as a class highlighting those impacts that were primary and those that were secondary and decided which of these were having the biggest impact on the people in the Caribbean.

Creativity was at the fore as groups developed their hurricane posters. Photo © Jodie Martin.

Developing critical thinking

Over the course of the recovery effort, we regularly tuned into BBC Newsround. The pupils had developed an array of video clips, reports and photos to show the aftermath of Hurricane Irma. As the recovery progressed, they watched and posed questions and we used 'hot seating' in an attempt to understand the thoughts and feelings of those involved. This was a great opportunity for the pupils to develop their critical thinking skills. They were keen to find out about the impact of the recovery, how prepared the islands were for hurricanes and how the inhabitants could be better equipped in future. Incorporating critical thinking skills brings me back to the importance of providing a structure for the pupils' learning. This work certainly reflected the University of Hong Kong's description of critical thinking: 'the ability to think clearly and rationally. It includes the ability to engage in reflective and independent thinking'.

After looking at physical and human, primary and secondary impacts and developing questions to promote critical thinking, the pupils formed their top six questions using a 'Who? What? When? Where? How? Why?' framework. They then used these questions to find more detail about the hurricane and the impact it was having. The pupils also began developing maps of the world and the Caribbean to follow the path Hurricane Irma took as well as which countries were providing relief effort.

Creative thinking for global citizenship

Following this work, the pupils' creativity really came into its own. Working in groups of four or five, they had to take their learning further to develop a poster all about Hurricane Irma (Figure 1). The groups spent a day doing this, accessing newspapers, computers and books as necessary. I was extremely proud not only of their ability to work independently (to know when to resort to ICT and when to present detail by hand), but also the way they wove in their use of critical thinking skills. The result was seven very different, very informative posters, each of which told the story of Hurricane Irma, its impacts and how the relief effort was handled.

Work such as this helps to develop responsible global citizenship in our pupils and fosters empathy and a deeper understanding of the environment. It adds excitement to teaching and learning as well as helping to meet one of the purposes of the proposed new Welsh National Curriculum: to develop pupils who are 'ethically informed residents of Wales and the wider world'.

WEB RESOURCES

Geography in the National Curriculum for Wales: *http://learning.gov.wales/docs/learningwales/publications/130424-geography-in-the-national-curriculum-en.pdf*

New School Curriculum for Wales: *http://gov.wales/topics/educationandskills/schoolshome/curriculuminwales/curriculum-for-wales-curriculum-for-life/?lang=en*

University of Hong Kong: *http://philosophy.hku.hk/think/critical/ct.php*

Richard Hatwood is Geography Subject Leader and Additional Learning Needs and Inclusion Co-ordinator at Ysgol Esgob Morgan, St Asaph, Wales, and a member of the Primary Geography Editorial Board.

THE PRIMARY GEOGRAPHY INTERVIEW

ROBERT MACFARLANE

Dr Robert Macfarlane.

Dr Robert Macfarlane is a teacher and writer. He is a Fellow of Cambridge University where he is presently Reader in Literature and the Geohumanities in the Faculty of English. He is also a well-known British writer, with many best-selling and prize-winning books about landscape, nature, memory and travel. Here he first answers questions from *Primary Geography*, then from primary school children Lola, age 7; Harvey, age 8; and Oliver, age 12.

How and why does geography inspire you?

I still remember the thrill when I first discovered, as a teenager, that 'geography' means 'earth-writing', or 'that which writes the earth'. It was one of those moments when a familiar word falls open like a sliced geode and reveals its wonderful interior. Wow! What more vital or various or fascinating a task could there be than writing the earth? Embarrassingly, though, I didn't even do GCSE geography, and went on to study literature as an undergraduate, and then for a PhD.

These days, despite being a Fellow in the Cambridge English department, I tend to refer to myself as a 'geographer in poor disguise', because everything that I do – my books, teaching, writing, wider collaborations – is concerned with understanding some of the complexities of landscape, nature-culture relations, place and environment, and what the American writer Wallace Stegner once called 'the geography of hope'.

The Royal Geographical Society kindly gave me their Ness Award a few years ago, for 'popularising geography in wider culture and society', and the ceremony felt like a coming-out: at last I could proclaim myself a geographer, loud and proud!

What was your favourite place as a child and why?

A stream known as the Burn O' Brown that ran through the modest heathered hills at the back of my grandparents' house in the Cairngorms. If I close my eyes, I can see the scene as clearly as if it were last week, though it was thirty years or so since I was last a child there. Hot sun on the face, and the cry of curlew from the shoulder of moor across the valley. The heather is in pink flower and there are patches of late yellow gorse, so it must be July or August. I've just found a roe deer antler bleached white by the sun and weathered smooth, and I am carrying it as if it were treasure or a rare coral. A horseback-brown burn runs a few yards away, pooling at the turn of a bend, and tiny trout flicker among the shadows. It is – and was – a dream-vision of a Scottish day of quiet miracles, spent among calm hills; and a brief return to a childhood I was lucky to have.

What is your favourite place as an adult and why?

'Favourite' is tricky here, as my truly favourite place might be on a sofa having a hug and a natter with my three children, so I'm going to choose instead a place that I go most often and that has grown complexly into my consciousness over the past fifteen years. These are the Gog Magog Hills, the two chalk downs that lie to the south of Cambridge, and rise to the dizzying height of 76 metres above sea-level at their highest. I think of them as Cambridge's Himalayas, as we don't do mountains very well in the Fens. I run up to them three or four times a week. What fascinates me is their complexity and depth as a site: because they are high,

Scotland's stunning Cairngorms. Photo © Nick Bramhall.

well-drained land, they've been a focus for life for more than 5000 years, and the structures that mark them include Neolithic causewayed enclosures, mysterious Bronze age tumps, a huge Iron Age ring fort, a Roman Road, an eighteenth-century Arab stallion breeding stables, Cold War infrastructure, all the way through to a modern-day golf course and a wildlife reserve. Their ecology (beechwoods, chalk) is rich, and they watch my city.

The Gogs remind me that the past doesn't lie in easy sequence, but rather jumbles itself up in a messy kind of simultaneity. When I first moved here, I found them stubby and stubborn, and longed for the vastness of the Cairngorms instead. Over fifteen years, they've beckoned me in with their intricacies and subtleties, and their status as an edge land, on the city's brink: what Victor Hugo memorably called 'bastard countryside'. I keep thinking I know all I can about them, and then they surprise me anew. A reminder that, in Nan Shepherd's words, 'the mind cannot take away all that [a landscape] has to give'.

What are your favourite weather words and why?

I am, unmistakably, a northern soul, in that I am drawn to high altitudes and high latitudes, to cold places and to high places. In the first sentence of a chapter in a book of mine called *Landmarks*, about language and landscape, I declare myself to be 'north-minded', and I can't imagine ever becoming 'south-minded'. So my favourite season is winter, my favourite weathers tend to be snow or bright frost, and some of my favourite weather words are, yes, hibernal: from 'apricity', meaning 'the 'warmth of the sun in winter', and the Scottish 'roarie bummlers', meaning 'fast-moving storm-clouds' (or, literally, 'noisy blunderers') and 'flindrikin', meaning 'a light fall of snow or a flimsy snow-shower'.

What is it that is so special to you about outdoor first-hand experience?

A reader reminded me recently that in *Mountains of the Mind*, my first book, I wrote that 'a map is an abbreviation: this is its definition, its strength and its limitation. To know a landscape properly, you must go into it in person'. Oddly, I'd forgotten writing those sentences, so I met them as a stranger, as it were, and they seemed true to me now as they must have seemed true to me when I wrote them; perhaps truer – for we live, in many ways, increasingly virtual and increasingly interior lives. The main 'touch' we share with the world is the swipe or tap of a 'touch-screen' device. Technology is miraculous, but so too is an acre of woodland or a patch of moor or mountain, or just a single tree in a city. In my experience, any landscape, vast or tiny, if entered into, walked through, touched, sniffed, even tasted, will surprise you. We can never exhaust a place, except through our own torpor.

Curiosity and wonder seem to me utterly natural to children, and largely effortful for adults. Put a child in a wood and – perhaps after initial anxiety, or even a period of eventually productive boredom, of which we shouldn't be scared – they will play, explore, improvise, dream and story-tell. In nature, children are 'wondernauts': instinctive adventurers in the marvellous.

Why did you begin writing *The Lost Words*?

Out of a strong sense of a gap widening between childhood and the living world in Britain; and a wish to try something that might close it, even a little. The evidence just kept mounting: we're all familiar with these surveys and the data they yield. 8-11-year-olds in Britain are better at identifying common Pokémon characters than common species of British wildlife (for 'Badger', read 'Bulbasaur'). In a 2008 National Trust survey, only a third of 8-11-year-olds could identify a magpie, though nine out of 10 could name a Dalek. A 2017 RSPB 'Birdwatch' survey smartly shifted the focus, assessing nature knowledge in parents rather than children. Of 2000 adults, half couldn't identify a house sparrow, a quarter didn't know a blue tit or a starling, and a fifth thought a red kite wasn't a bird – but nine out of ten said they wanted children to learn about common British wildlife. A 2017 Wildlife Trusts survey found a third of adults unable to identify a barn owl, three-quarters unable to identify an ash tree – and two-thirds feeling that they had 'lost touch with nature'.

The hunger is there, but the knowledge is not. Up and down the generations and ages, we are losing sight of the species with which we share our everyday lives, just as we are losing them from the landscape itself – there are more than 50% of British species in population decline at present. These were the disappearances, the 'losings', that Jackie Morris and I wanted to address in *The Lost Words*.

In 2017 a survey found 75% of adults unable to identify an ash tree. Photo © Dimitrina Lavchieva/shutterstock.com.

How did you whittle down the selection of words in *The Lost Words* and why did you choose them?

All the twenty words, from 'acorn' to 'wren' via 'conker', 'heron', 'kingfisher', 'otter' and 'willow', were words that had been removed from a widely used children's dictionary in 2007 because they were being insufficiently often used in the wider language. This seemed to Jackie and me a striking symptom of how the common natural world, the creatures and trees we live our lives with, were slipping from sight and thought. The dream of *The Lost Words* was to summon back these words, by a kind of magic of word and image, into the mouths and the minds-eyes of children. For each word I wrote a spell, an acrostic to be spoken aloud, and Jackie painted first the word's absence from the landscape, then its golden icon, and finally – after the spell had been spoken – the word's/creature's return to the world. The book's subtitle is 'A Spell Book', and it was founded on a kind of magical thinking.

The amazing thing to us is how that magical thinking has come true in the few months since the book was published: it's been a wild ride. *The Lost Words* became a major bestseller, and is already being used in hundreds of schools, from nursery through to secondary, from forest through to inner-city, up and down the country. There's a crowdfunder underway at present, begun by a young person in Scotland, to raise enough money to get a copy into every single Scottish primary, secondary and special school.

Every day we are sent photographs, stories and film-clips of children reading out the spells, of how they've somehow 'summoned' kingfishers, wrens or otters out of the landscape (when of course all the book has done is encourage people to look). The book has also started to be used by those working with dementia and memory loss in older people; a way of re-calling differently 'lost' words.

I've never written a book before that has entered culture with this speed or power, or that has held this capacity to bring about change. When I try and work out why *The Lost Words* has lived the life it has, I come back to two things. First, that it was a book made out of hope and with open-heartedness, and it has been met with the same qualities. And second, that it tapped into a deep reserve in this country of both anxiety about, and a wish to change, our relationship with the living world around us.

I'm giving a proportion of the money from every copy sold to Action for Conservation, a young charity of which I'm a founding trustee, which works with secondary school pupils to inspire them to take action on part of the natural world. We run workshops, summer camps and ambassador schemes. I'm so proud of the charity and the work it does (any of your readers wishing to get in touch – please do so – see web panel), and especially its focus on those children and schools where access to nature is especially hard to come by.

> Once upon a time, words began to vanish from the language of children. They disappeared so quietly that at first almost no one noticed – until one day, they were gone.
>
> But there is an old kind of magic for finding what is missing, and for summoning what has vanished. If the right spells are spoken, the lost words might return…

From *The Lost Words*.

Harvey: When did you become an author?

When I was 21, and a little lost in my life, I made three rules for the future: I would not wear a tie to work, I would not live in a big city, and whatever I did it would involve books. Once I had those rules in place, taking decisions became a little easier. I'm glad to say, I've kept to all three of them. Around that time, I also decided I wanted to have a go at answering the oldest question in mountaineering, which is 'why climb a mountain?'. That famous question has a famous answer, from George Mallory, who died on Everest in 1924: 'Because it's there'. Mallory's answer was three words; my answer became three hundred pages long, and a book called Mountains of the Mind, which I wrote in my early to mid-twenties. I realised that to answer the question, I'd have to trace huge contour-lines of feeling, behaviour and culture, as our attitudes to mountains changed from dislike, fear or indifference (in the 17th century) to obsession, passion and adoration (the 19th century onwards).

Harvey: Why did you become an author?

To solve puzzles. To make sentences that fitted together like train-tracks. To see patterns of thought and image emerge and writhe and change before my eyes. To maybe write stories or pages that could enter the minds and imaginations of other people, and live there for a while.

Lola: Who did the pictures?

Jackie Morris, an artist who lives in a tiny house on the very westernmost tip of Wales, above a sea-cove where seals come to sing on the rocks, below a crag where ravens perch and fly and cry. Jackie is a magician. She paints blackberries so bright you want to pick them from the page and eat them. Her brushes have the power of sorcery to them. And when she goes for a walk over the headland, as she does each day, her white cat walks with her, for miles at a time, and she is also often followed by two other cats, two dogs, ravens, wrens, pigs, horses and the odd sheep.

Oliver: Which of your authored books do you most cherish?

The Lost Words is the one with most magic in it. The Wild Places is the one written with most gleam and passion. The Old Ways is probably the 'best' book I've ever written. Underland, which I'm finishing now, which is about underworlds of many kinds, and has taken me six years, is – pun alert – by some distance the deepest of my books…

Harvey: Have you ever written about a tornado?

Best. Question. Ever! No. Though I have written about spending the night out in a massive storm on a beach called Sandwood Bay in the far north of Scotland, and the strange things I saw and dreamed of that night…

Lola: Why did you choose Magpies? [to write about them in *The Lost Words*]

Ha! Because I knew I wanted to write a Magpie Manifesto for them. They're furious, argumentative, noisy, cocky, vivid birds. I wanted to celebrate their energy and their glint-eyed, pick-a-fight-in-an-empty-room attitude. Also, magpies aren't black and white, as children know. They're white and black and glowing purple and shimmering green and oily blue: gloriously dressed pirates of the garden, sashaying marauders of the field.

WEB RESOURCES

Action for Conservation: *http://www.actionforconservation.org/*

Robert's books include *Mountains of the Mind: A History of a Fascination* (2003), *The Wild Places* (2007), *The Old Ways* (2012), *Holloway* (2013, with Stanley Donwood and Dan Richards) and *Landmarks* (2015); works which have particular resonance for geographers due to the deep understanding Robert weaves into the triple concepts of space, place and scale. In 2017, Robert produced *The Lost Words*, a book of written spells, illustrated by Jackie Morris, which invokes the power of language to keep our knowledge of the natural world alive. His latest book is about subterranean spaces and deep time.

CAN WE PLAY OUTSIDE TODAY?

CATHERINE OWEN, SEBASTIAN WITTS AND LESLEY BURNETT

Their recent visits to schools in Kampala, Uganda, inspired Catherine and Sebastian to work with Lesley on how pupils in the UK can explore the influence of weather and climate on the lives of pupils in contrasting locations.

Comparing climate

Climate facts: Uganda

The capital of Uganda, Kampala, is located on the Equator and has a tropical climate, which is very different to that of the UK. The average annual temperature in Uganda is 21.3°C, and approximately 1300mm of precipitation falls each year. Temperatures are similar all year round, and are high because the sun shines more intensely on the Equator. The rainfall is high because intense heat at the Equator causes the air to rise, where it then cools, leading to condensation and then precipitation. In Uganda two wet seasons occur: one from August to December and the other from February to June.

Climate facts: UK

The UK has a temperate maritime climate, which means that it is mild and wet. The average temperature in London is 11.9°C and the annual precipitation is 596mm. The location has a major impact on climate, with ocean currents keeping UK temperatures mild and winds from the south-west bringing rain throughout the year; therefore, the weather is very changeable. The UK is cooler than Uganda because it is some distance from the Equator.

The influence of climate in Uganda and in the UK

We visited Kampala during the dry season in July 2016 and again in the wet season in October 2017, and took photos in several primary schools and in other locations to capture life in Uganda in different seasons (Figure 1). Download a PowerPoint presentation of these and a variety of other images to use with your class – see web panel. Pupils could recreate the scenes of Uganda, capture their own scene, then place the Ugandan and UK images side by side to look for similarities and differences. When exploring the photos, pupils can consider how the climate affects clothing, activities carried out in school, and buildings in both countries.

Possible lines of enquiry

How does climate affect housing styles?

Screen the BBC video (see web panel), which shows different houses in different parts of the world, then ask key stage 1 pupils how climate and environment affects the building material used. This offers a useful starter for pupils to investigate before focusing on life in Kampala, Uganda.

Why is climate different around the world?

The difference between weather and climate can be illustrated by the fact that although the climate of Uganda is wet, the weather in most of the photos is dry. Discuss how climate is the average weather over a given time period, while the weather is the day-to-day condition of the atmosphere at any specific place and time. Usually, rain in Uganda is very intense: a

Figure 1: Our photos captured life in Uganda in different seasons, here showing the difference at St Charles Lwanga school. Photos © Catherine Owen.

large amount falls in a short time then the sun comes out again. The YouTube video 'World biomes: an introduction to climate' could provide the starting point for key stage 2 pupils to research different climates around the world. Pupils could then focus on the climate and weather in Uganda using the Our Africa: Uganda website (see web panel).

How do weather and climate affect the geography of Uganda and the UK?

Locate Uganda on a globe, atlas or digital map (Figure 2). How might being on the Equator affect the country's climate? This is a good opportunity to revise/learn about the continents and introduce the main climatic zones. Next, locate the UK. Talk about how being an island some distance from the Equator, rather than in the centre of a large continent, makes our climate different from that of Uganda. This could lead on to looking at why seasons are different in the UK and Uganda and considering the different characteristics of each season.

What type of school building and playground is needed for these climates?

First, pupils could identify good/poor locations in their school environment in different weather conditions (e.g. shade from the hot sun under a tree in summer, somewhere for wet play when it rains). After understanding their own environment, pupils could think about Uganda and the wider world. Key stage 2 pupils could sketch the perfect school environment for each location, thinking carefully about what people need in each of the different climatic conditions. They could also compile a list of the different types of weather experienced over a year in each location, marking on their sketch which part of the building/playground would be fit for use in particular conditions. Key stage 1 pupils could draw what the school uniform might look like for a pupil in a hot country and label their sketch to explain their choices. Carrying out these activities before showing the pupils the photos of Uganda would enable pupils to compare their ideas with what the photos show.

How does the weather change in Uganda and the UK?

Pupils could record the weather in their home area for a week and then use the internet to find the weather in Uganda for the same period (see web panel).

How does climate affect the characteristics of and activities in a place?

Pupils could look at the photos showing how Ugandan pupils access water and how people wash their clothes, and compare these with their own lives. One image shows a girl eating locally grown beans and posho (a porridge made of maize or rice) for lunch; pupils could compare this with their own lunch and consider where their food comes from. Similarly, looking at the display of fruits and insects in the Ugandan classroom, pupils can discuss how and why these are similar and different to the UK.

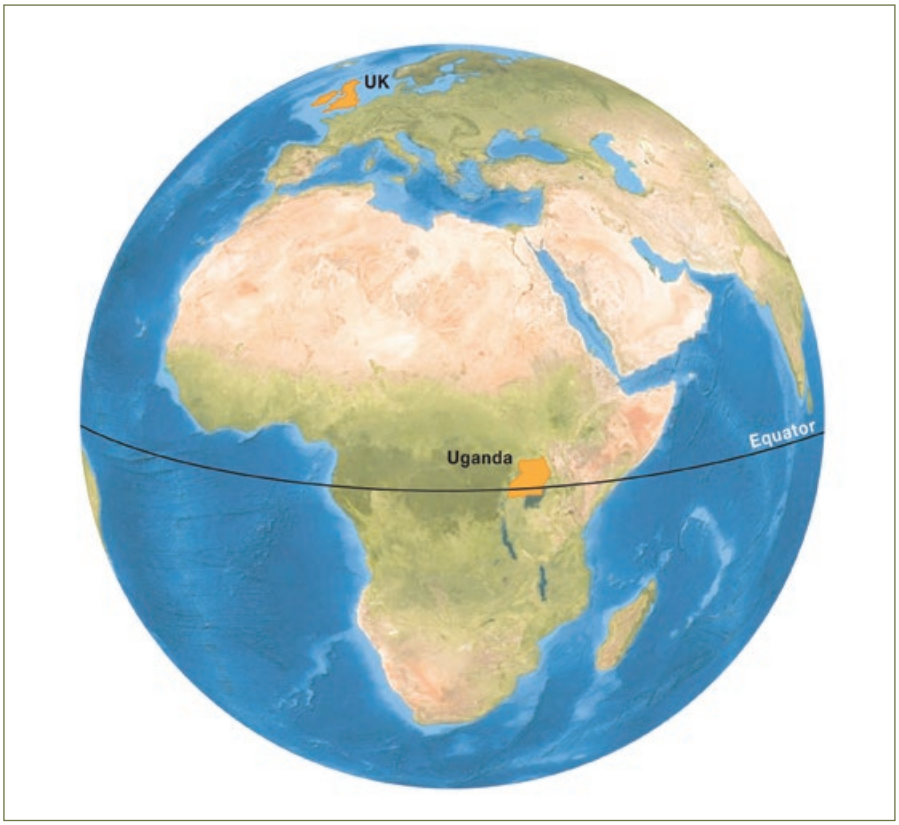


Figure 2: The locations of Uganda and the UK and their proximity to the Equator.

How does weather affect everyday activities in a place?

Discuss how the weather affects what and where pupils play, and what happens in your school on a wet day. Look at the pictures from the wet and dry seasons in Uganda. How might the type of weather affect Ugandan pupils' play times during wet and dry seasons?

What can we learn/not learn about life in Uganda from photos?

How can a snapshot of a place in time be illuminating, but also deceptive? Give half the class the image of St Charles Lwanga School, Kampala, in the wet season and the other half the image of it in the dry season (see Figure 1 and PowerPoint download). What different view does each group have of the school? Compare their views and discuss how these were influenced by looking at only one image. What is the danger of using a single image to draw conclusions about that place?

Making links

The primary schools we visited in Kampala are keen to develop links with schools in the UK. Developing such a link would enable your pupils to e-mail or Skype your questions directly to staff and pupils in Uganda. Consider applying to the Geography Association Initiatives Fund to enable a Ugandan geography teacher to visit your school or vice versa. To find out more about either initiative, email Sebastian Witts (switts@kingalfred.somerset.sch.uk) or Catherine Owen (cowen@kingalfred.somerset.sch.uk).

WEB RESOURCES

BBC 'Houses around the world' video: *www.bbc.co.uk/education/clips/z3xsb9q*

Download the presentation of Ugandan images: *www.geography.org.uk/pg*

Explore Ugandan weather: *www.unma.go.ug/index.php/weather/daily-forecasts*

Our Africa: Uganda: *www.our-africa.org/uganda*

YouTube on climates: *www.youtube.com/watch?v=ZouWWVyz9v8&t=32s*

Catherine Owen and Sebastian Witts teach at The King Alfred School in Somerset. Lesley Burnett is a primary school geography teacher. All are members of the GA's International Special Interest Group.

ENERGY MATTERS!

ALEX GREEN

Learning about energy and climate change matters. In this article, Alex offers ideas on tackling the topic with young pupils and highlights the importance of discussion using a good vocabulary in the classroom.

How do you explain energy to pupils? You cannot see or feel it, and it involves using lots of technical terms and processes that some adults find hard to grasp. If we are going to produce new generations of energy-aware adults, it is vital that we educate pupils about how our energy use links to climate change.

Here, I outline a lesson that introduces pupils to the concept of energy and climate change, and the idea that they can play a part in sustainability. Tapping into the LESS CO2 Programme and Ashden Awards (see web panel), the lesson starts pupils in thinking about the subject area; additional lessons on related and extended topics can then follow. I developed this lesson with year 2 pupils at St Augustine's Catholic Primary in Kent, and my top three tips for success are shown in Figure 1.

Giving pupils power!

Pupils enjoy having the responsibility for making an impact on their surroundings. It allows them to develop a sense of ownership. In this topic area, they take pride in suggesting energy-saving measures to teachers and parents/carers. For those pupils who do not excel in other areas, gaining responsibilities can be especially empowering.

In this lesson, year 2 pupils learned about what energy is, the different types of energy available and how we use energy at home and in school. The discussions (Figure 2) and generation of questions helped to demystify the concept of energy.

The concept of climate change can be challenging to teach to younger pupils and, as mentioned in Figure 1, it is key to avoid a message of doom and gloom. We talked about the importance of looking after our environment to help ourselves, the climate, the world, and the plants and animals that inhabit it. Pupils discussed the concept of protecting the planet and how we can care for it responsibly for future generations. Links were made to how we may look after a toy we want to pass on to younger sibling, and how we keep our classroom tidy and in good condition so that next year a new class can use it. We discussed the fact that when we use too much energy from fossil-fuel sources, we are creating problems for everyone else. We linked this to one indicator: the rapid change in the climate and the weather we experience and how it affects others.

1. Keep it simple and positive – avoid complexity and gloomy messages about climate change.
2. Use lots of local and global photos to demonstrate weather and climate.
3. Give the pupils ownership of the investigation and empower them to make changes.

Figure 1: Alex's Top three tips for success in teaching about energy use and climate change.

Focus for discussion

- Equipment at home or in the classroom that use energy; plugs and batteries being a clue. We need energy for screen time.
- Lighting, heating, cooking, learning.
- A change in global and regional climate patterns due to the impact of people.
- Sunny days, heavy rain, droughts, floods, increased temperature.
- Energy use (fossil fuels) causes more carbon dioxide to be released into the atmosphere.

Questions

- Why is energy important? How does it make a difference?
- What would life be like with no power? Where in the world do people live without power?
- What does climate change mean? How does energy use impact on the climate?
- What can we do about it?

Figure 2: Aspects of the energy topic that lead to discussion and questions.

Exploring weather and climate

We explored the idea that there can be 'good' weather (warm, sunny days with a bit of rain to keep our gardens looking pretty) and 'bad' weather (days or weeks of storms, and flooding or droughts). Pupils talked about how, when we use too much energy, it can cause more of the 'bad' weather that is having an impact on people's lives around the world. The pupils were aware of recent stories about flooding in the media and could draw on this in their discussions.

When energy and sustainability are integrated into learning they can be used as linking threads between curriculum areas. In my experience, pupils gain the best understanding of sustainability and the environment when the theme recurs throughout their learning, a point emphasised by Scoffham and Owens (2017). Here, pupils learned about the immediate impact of their behaviour (e.g. always having the lights on in the classroom) on the local and global climate by focusing on recent news coverage of extreme weather events around the world. With more advanced pupils, I recommend that teachers explain the basic concepts of relative wealth: how some people have no access to energy and how their lives might differ from our own. In this lesson, I used class activity time to lead these discussions with small groups of pupils.

Figure 3: Edward, from Year 2 in St Augustine's Catholic Primary School, created this poster to help remind teachers and pupils to turn lights off.

Figure 4: Pupils supporting each other to learn the new energy vocabulary while creating their posters. Photo credit: Alex Green/Ashden.

What we did

We split the class into small groups. Their task was to design a poster to remind people to save energy (Figure 3). As well as encouraging them to use key vocabulary (energy, climate, switch off and planet) (Figure 4) we stated that the most important start point is to actively reduce energy use and that anyone, including themselves, can begin to do this. We discussed what makes a good poster – size, colour, pictures and artwork to convey a clear message (who is the poster for?), then gave them responsibility for their learning – the pupils loved the feeling of power (Figure 5).

> 'I made a poster to put in our headteacher's office, so that she will remember to turn off her lights when she leaves the room.' (Sofia)
>
> 'If we waste energy it isn't good for our planet.' (Aiden)

Figure 5: Pupils' comments on their posters.

To take the work further you could…

- Use ICT for the poster design session
- Present energy saving messages to the school in assembly
- Write to parents about energy saving – using persuasive writing skills
- Make a pledge to save energy – create a tree of pledges written on leaves on a display board
- Speak to key staff and governors about the posters around the school
- Present findings to the school governors
- Learn about energy use in their own home. How can they make savings?
- Learn about climate champions (e.g. Al Gore, David Attenborough, Ashden Award winners)
- Learn about sustainability through stories (e.g. *The Lorax* by Dr Seuss)
- Write poems about the environment and energy saving
- Learn about different types of extreme weather and their impact around the world, linked to locational knowledge
- Tap into LESS CO2 (see web panel). This programme helps schools across the UK to reduce their energy use and engage with staff and pupils about energy and sustainability. Clusters of 15 schools take part, supporting each other to make changes, learning from experts and sharing best practice.

References

Scoffham, S. and Owens, P. (2017) *Teaching Primary Geography.* London: Bloomsbury.

WEB RESOURCES

Al Gore 'An Inconvenient Truth': *https://www.youtube.com/watch?v=mOrHnctozrY*
Ashden Awards: *www.ashden.org*
David Attenborough BBC 'Blue Planet II': *www.bbc.co.uk/programmes/p04tjbtx*
LESS CO2 Programme: *www.lessco2.org.uk*
Dr Seuss' *The Lorax: www.youtube.com/watch?v=aa82mcXO9AQ*

As Schools Programme Manager at Ashden, Alex runs the LESS CO2 programme and works with partner organisations to support schools to save energy, as well as increase sustainability awareness in young people.

A CLIMATE CHANGE ASSEMBLY

HENRY GREENWOOD

Henry offers a plan for an interactive assembly on climate change designed to promote and motivate pupils into positive action for the future.

I was invited to Torriano Primary School in Camden, London, to deliver an assembly about climate change through my work as a mentor to the School on the Less CO2 programme. The school places an emphasis on education for sustainable development; therefore, on arrival, I encountered a huge display on the UN's Global Goals. Torriano Primary School is an expert centre for the Global Learning Programme and Head teacher, Helen Bruckdorfer, explained that it was central to the school's ethos.

It was no surprise, therefore, to find that, during the assembly, the key stage 1 pupils were thoughtful and well-informed on a topic on which many adults have no clear understanding. As a former secondary school maths teacher who left full time teaching in 2015 to set up the Green Schools Project (which helps schools to set up and run a student-led environmental programme), I have delivered many assemblies about climate change, mostly to teenage audiences. It is a completely different challenge getting the attention of early primary pupils, so I enlisted the expert assistance of a primary teacher friend to adapt my method of delivery.

Figure 2: Climate change could be considered a challenging concept for 5-7-year-olds, but a few props and some willing volunteers make the task a lot easier. For such a serious topic, we used the back of the inflatable sun.

I introduced myself, explaining my background. I love the reaction I get when I ask the pupils to put up their hands if they like maths; few keep their hands down at this age. When I ask the same question of a room of 14-year-olds there is often a very different response!

Questions and props

After a few introductory questions to assess what the pupils already knew about climate change and how we can protect the environment, I got to the heart of my explanation. Climate change could be considered a challenging concept for 5-7-year-olds, but a few props make the task a lot easier. I invited one volunteer to hold up an inflatable globe (Figure 1) and point out where we were located, demonstrating our place on the planet. Another volunteer held up a large inflatable sun (Figure 2). The best one that I found online has sunglasses and big smile on one side, so after displaying this side, we agreed that for such a serious topic the volunteer should hold it the other way around to be more realistic.

I explained that without the sun being the 'right' distance away, our Earth would just be a big, cold rock with no life on it. We enthusiastically thanked the sun for giving us the heat that enables us to live. The next prop was a blanket, which the pupils pointed out helps to keep you warm. This was placed over Earth and I explained that the blanket, which represents a layer of gases called the atmosphere, is just the right thickness to keep our planet at the best possible temperature for all the plants and animals on Earth (Figure 3).

Using images

We then moved on to some photos. The first three (a power station, a traffic jam and a forest being cut down), demonstrated the activities that people are doing that increase the amount of greenhouse gases being released, making

Figure 1: Showing our place on the planet. Photo © Sean Flannery.

Figure 3: I represented Earth's atmosphere with a blanket and globe. Photo © Anna Grandfield.

Figure 4: The assembly asked pupils to make a promise to help tackle climate change.

the blanket around Earth a little thicker. The pupils were quick to point out that if the blanket gets thicker, Earth will get warmer.

The next set of photos (showing a polar bear on melting ice, a farmer standing on parched land and a row of houses flooded up to the first-floor windows) made it easy for pupils to understand that with Earth getting warmer the ice is melting at the North Pole, which is a problem for polar bears. Similarly, forests being cut down has led to many other animals becoming endangered. I also explained that not only do rising temperature make it warmer, but they also make our weather more extreme, leading to periods of drought where farmers cannot grow food, and floods that result in people losing their homes or being killed.

Staying positive

Up to this point it is not a happy story, but I explained to the pupils that – unlike many big global problems – every individual can help to tackle climate change and therefore feel good about the fact that they are part of the solution. The final set of photos showed wind turbines and solar panels, a city centre that has been pedestrianised and fresh vegetables grown locally. These indicated a few of the things that we can do to help to reduce climate change. I explained to the pupils that, along with tackling this big problem, the photos showed other benefits to using less non-renewable energy include cleaner air, a more active lifestyle and eating more healthily.

Coming up with ideas

To finish I suggested things that the pupils could do in school such as a 'switch off' campaign, by growing vegetables, by ensuring that the school recycles as much waste as possible and by encouraging each other to walk to school. When pupils were asked to think of a promise they would make to help tackle the problem of climate change (Figure 4), one pledged 'I'm going to walk or get the bus instead of asking my mum to drive' and another pledged 'I'm going to play on my XBox less'. Getting pupils to make these kinds of sacrifices made me sure that the message had hit the mark!

The reaction to the assembly was very positive. Amy Williams, the teacher co-ordinating my visit, said 'The pupils absolutely loved it. It was interactive and visual and everyone was motivated to think of a promise at the end'.

Ending with pupils leading

Any teacher could deliver this simple assembly with the help of a few props and photos (mine were sourced online). The assembly can be used to motivate pupils to take personal action and to encourage them to become part of a School Eco-Team – whereby pupils are given the opportunity to lead projects on environmental issues. Forming an Eco-Team committee and enabling them to run campaigns can help pupils gain important skills as well as improving the environmental performance of the school (Figure 5). These activities encourage young people to live in an environmentally responsible way and help drive the transition to a sustainable society. What could be more important than that?

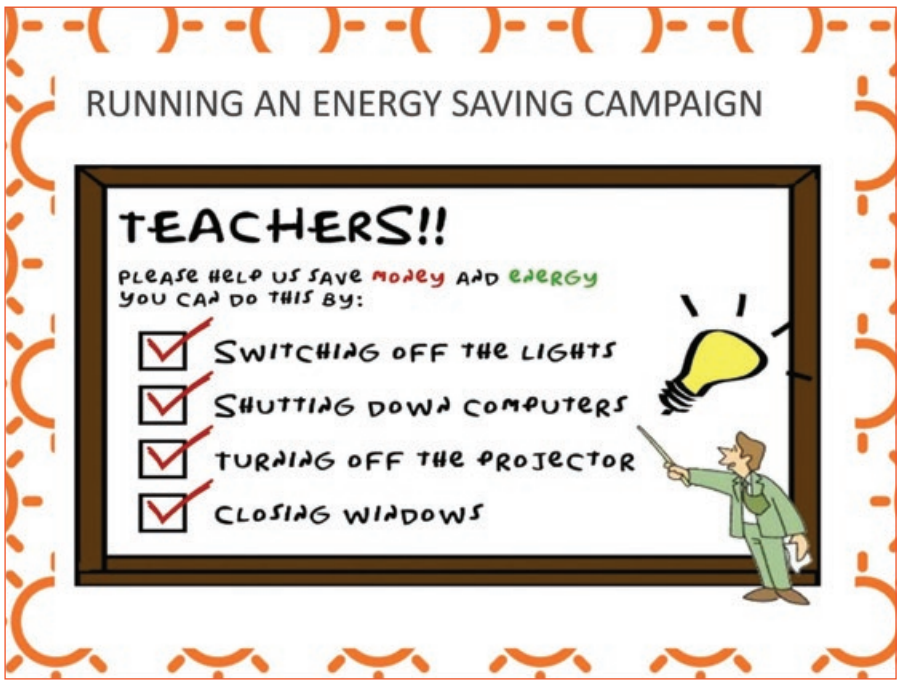


Figure 5: Eco-campaigns can help pupils gain important skills.

WEB RESOURCES

Global Learning Programme: *http://glp.globaldimension.org.uk/*
LESS CO2 Programme: *www.lessco2.org.uk/about-us*
Young Geographers Go Green CPD unit: *www.geography.org.uk/Young-geographers-go-green-online-cpd*

Henry Greenwood is a mentor to schools that are taking part in the LESS CO2 Programme.

A WEEK OF RAIN…

VICTORIA ASPIN

Here, Victoria explains how a week of focused activities were used to enable year 1 pupils with severe, profound and multiple learning difficulties to develop their skills and their understanding of rain.

Abbey Court in Medway, Kent, is a school for pupils with severe, profound and multiple learning difficulties aged 3–19 years (key stages 1–4). The curriculum is flexible and personalised to meet the wide range of learning difficulties and individual needs present at the school. We use a 'spiral' curriculum in geography (and all other subjects) to revisit key concepts throughout each term, aiming to strengthen pupils' understanding. Geography is delivered as part of the offer for all pupils and is taught by non-specialist teachers, co-ordinated by a whole-school subject leader. The subject leader provides coverage plans and schemes of work designed to challenge pupils in relation to their abilities.

The geography curriculum at the school aims to:

- develop pupils' confidence within all areas of geography
- encourage awareness of the pupils' immediate environment and beyond
- stimulate pupil curiosity and interest, and
- allow pupils to participate in a variety of activities that are engaging, relevant and challenging.

When planning activities, teachers always aim to make 'big' concepts relevant and meaningful through real-life sensory experiences. In year 1, pupils work on the topic of weather. This topic covers all curriculum subjects for the term, but lends itself to the delivery of geography in particular.

The concept of identifying daily and seasonal weather changes, first in the UK and subsequently hot and cold areas across the world, is broken down to enable pupils to understand what weather is first. Each week the teacher then plans activities to cover different types of weather in order to develop pupil recognition and understanding of the weather type as well as their functional skills. The first week of the topic focused on rain.

It's raining, it's pouring

Pupils in year 1 are mainly working at the early 'P' levels; therefore, activities used to develop early geography skills included:

Photo © Victoria Aspin.

Photo © Victoria Aspin.

P2.2: Co-operating with shared exploration

P3.1: Exploring materials in increasingly complex ways

P3.2: Responding to options and choices with actions or gestures

P4: Demonstrating that they know that certain actions will produce predictable results.

To ignite the pupils' interest, to focus and cue them into the geography, the same introduction was used throughout the 'rain' week. The teacher played a video and audio of a rainy day and encouraged them to watch and listen. She explained that they would be learning about weather and asked where the pupils would find weather – giving them the choice of 'outside' or 'inside'. When they had made their choice, the class sang weather-related songs: 'I hear thunder…' and 'It's raining, it's pouring…'.

Pupils and supporting adults then dressed in wet weather coats to begin working outdoors. The teacher had planned for a range of experiential, sensory and focused learning activities. All pupils began by sitting under an umbrella as water was poured from a watering can to enable them to experience and explore the sensation of being rained on (we had been hoping for some real rain that day, but we had to create our own). An important part of learning through experience is reflection time; at Abbey Court this is supported in ways that are appropriate to each pupil.

Next, we developed shared exploration through the use of a range of equipment, which included pouring water over pupils' hands to allow them to feel the sensation of it running through their fingers while listening to the sounds that water makes. Pupils were encouraged to reach towards the flowing water hand-over-hand (with support where appropriate), to pour the water for themselves and to make choices

Photo © Victoria Aspin.

(using their individual communication system) on what equipment they would like to use next or how they would like to use it. We introduced sponges to enable pupils to explore the fact that when a sponge becomes saturated it releases water, as does a rain cloud. Throughout the activities, the supporting adults use selected key words and phrases together with visual representations to embed the language of weather.

Some pupils carried out further activities designed to develop their understanding of the water cycle. For example, one experiment uses a clear container filled with water and topped with shaving foam to represent a cloud. Pupils were shown how to use a pipette to drip blue food colouring through the shaving foam and watch as it flows into the water – this illustrates how rain is released from a saturated cloud.

Throughout the lesson, adults observed pupils and made notes of any successes or challenges, which were then used to inform possible lines of development. Future lessons that would build on the interests of the pupils, and aim to further develop skills and understanding, were planned. This included beginning each 'rain' lesson with the same introduction and devoting time to exploring familiar activities before moving on. In our experience, this repetition is key to pupils' learning and supports a more comprehensive understanding.

We were delighted when one pupil demonstrated his developing recognition of weather. Later, and independently, after looking out of the window and seeing that it was raining, he collected his coat. Another pupil pulled her hand back as a sodden sponge was lifted from a bowl of water, thus showing an anticipation of it dripping on her.

For pupils with severe and profound learning disabilities, practical geography-based activities using multi-sensory approaches encourage an exploration of the world around them. This can begin with recognition of their immediate surroundings and then extended to wider environments and experiences further afield.

Photo © Victoria Aspin.

Victoria Aspin taught in a mainstream school before joining Abbey Court School in 2005. She became EYFS/KS1 leader in 2010 and then progressed to become Deputy Head teacher, with current responsibility for the primary site.

GA Annual Conference and Exhibition

University of Manchester, Tuesday 9–Thursday 11 April 2019

'CELEBRATING GEOGRAPHY'

We all think geography matters, and we are passionate about it – that's why we choose to be part of the GA and give our time to promoting the subject. At the current moment it is easy to feel rather downbeat as we fight to champion geography in a crowded and hostile policy landscape, so I think it is time to strike a positive note and remind ourselves of the enormous contribution that geography can make, not only to our own lives but also to the lives of the pupils and students we work with.

As a result, I have chosen 'Celebrating Geography' as my Presidential theme for 2018–19. Come to the 2019 Annual Conference to join in sessions that share classroom success stories, debate curriculum issues, disseminate the latest research findings and explore the fundamental principles that underpin the discipline. The resources exhibition and the unique chance to network add to this heady mix. This is a chance to be inspired by others, exchange ideas and celebrate all that geography has to offer.

Dr Stephen Scoffham,
GA Senior Vice President 2017–18

Get involved

If you're interested in proposing a session for inclusion in the Conference programme please e-mail Lucy Oxley (loxley@geography.org.uk) before the end of June 2018.

GET IN THE PICTURE ABOUT CLIMATE CHANGE

PAUL SPEAR

How can you stimulate your pupils to use their thinking and questioning skills? As Paul shows, you can challenge them to dive into an image! Images offer a great starting point for investigations into climate change.

Ways of seeing

Why did I use images rather than information, recounts or even news articles as a starting point in my investigations? The answer lies with John Berger's *Ways of Seeing* (see web panel). To some extent, the title of his book describes my approach to teaching. What I really love about it is how Berger takes an image and tells the story behind it. Using an image to stimulate thinking and construct meaning struck a chord with me and I have used the approach in many subjects. However, history and geography particularly lend themselves to this teaching style: using images is a vital part of graphicacy and a life skill (Mackintosh, 2011).

Promoting thinking skills

Why are images so effective at promoting pupils' thinking skills? They are instantly enfranchising and inclusive: using a picture offers all pupils the opportunity to step into context and imagine they are in that place. Reading a technical text or a long recount about climate change can create barriers to some pupils' engagement, whereas most pupils enjoy examining pictures. They can offer opinions on or see possible narratives in an image, and do not need to have strong reading skills or be good at analysing written information.

Research into use of images

In 2015/16 I took part in action research about the use of images in the classroom, during which I was able to explore in more detail the variety of ways of using images to stimulate pupils' thinking and enquiry skills. I collected pupils' work and recorded their responses (see web panel).

I have used many techniques to elicit thinking using images. One that works well is to ask pupils to draw themselves into an image and then imagine what they can hear, see, smell, taste and feel. Pupils will often see things that are imperceptible in the image, but this demonstrates they are starting to think more widely about issues that the image shows. Often they start asking question that lead to a more detailed understanding of the context. This then becomes a spur to carry out research on the topic using the questions the pupils formulated. As a result, they become far more engaged with finding the answers.

Climate change and environmental issues

I planned a unit that dealt with climate change and environmental issues in conjunction with Sara Abbas at Mulgrave Primary in Woolwich. (The opportunity to work in collaboration with other schools was a rewarding experience.) I learnt a great deal from Sara on how to plan a unit that uses the following two approaches, and about how asking questions within these contexts can provide pupils with a focused lens through which to conduct their research. We looked at:

- conflicting arguments, focusing on how media can persuade us to occupy a certain viewpoint, and
- local, national and global contexts.

I wanted to use images to get the pupils thinking about locational knowledge and the effect of climate change on places in the future. First, pupils learned how to use an atlas to acquire locational knowledge. They then spent time understanding how to create maps and atlases of their own using Digimap, OS maps and atlases (see web panel), and used Google Earth to zoom in on an area, which enabled them to research and understand what physical details they needed to add to their maps. Next, the pupils were able to use their knowledge of using and interpreting atlases and maps to create a map of an area of their choosing.

This in itself was an interesting activity and we could have spent some time discussing how the pupils chose the information they had identified as important enough to appear on their map as well as how they chose to represent it. However, my main focus here was how the use of images can stimulate thinking about environmental issues.

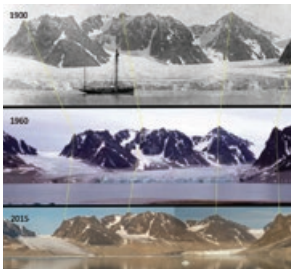
Next, I showed the pupils images, each of which related to climate change issues, and introduced the images within the context of understanding biomes. The images comprised pictures showing glacial retreat in Antarctica; deforestation in a tropical rainforest; charcoal burning and deforestation; and a Polar bear roaming a waste dump on the outskirts of a town (see web panel). I asked pupils to think about the questions and discuss them, first in pairs then in groups. Pupils were asked to imagine they were in the picture and to record their thoughts on sticky notes, which they stuck to the picture.

Pupils provided strong written responses to the images (Figure 1), which spurred them on to investigate what was happening. The pupils researched the issues around the different possible effects of climate change and they began to theorise about what might happen in the future to the places they had investigated.

I asked the pupils to think about the maps they created previously: How would these change in light of the image they had looked at and what their subsequent further research had told them? Then they were to think about the places they had investigated and create a map of these locations 50, 75 and 100 years in the future. We used the Thinking Actively in Social Context (TASC) wheel (see web panel) to structure our approach to map making and pupils designed maps that showed their thoughts.

Pupil responses

Looking at the pupils' responses to the pictures, the work motivated them not just to further research, but also to plan their vision of future places. It was also interesting to note that it was those pupils who are often most reticent to contribute in class, or who find new concepts challenging, that offered the most enthusiastic comments relating to the images. I asked them to evaluate their learning, here are some of their responses:



Glacial retreat. Photo © Andreas Weith.

'It's interesting that things can change very fast.'

'How does the ice melt and why?'

'Does this only happen in Europe? How can we make this stop? Does it affect us in any way?'

'Does this happen in other cold biomes?'

'Climate changes (affect) everything; snow falling, icebergs melting.'

'The interesting part is that it has changed each year.'

'The world is changing all the time and many of the things we do around the world is affecting physical geography.'

'I want to find out why this is happening. It's interesting what's changed since 1900 – 1960 – 2015.'

Deforestation in a tropical forest. Photo © Jami Dwyer.

'Who destroyed it? Why is it all destroyed? The thing that is interesting is that the background is good but the front isn't!'

'I want to find out who cut the trees down. It's interesting about how some of it is alive and some of it is dead. I feel this is not right and strange.'

'I think they took the picture to show our world is being destroyed.'

'I want to find out if there is a better way of obtaining wood without destroying the wildlife.'

'What did this place look like a decade before?'

'I feel angry.'

'Why would you do this if you knew animals live here?'

Charcoal burners. Photo © Kelberul.

'I feel half dead because of the atmosphere. I want to find out why we are destroying this place.'

'I can smell smoke – I would want to find out what is happening here.'

'I would want to find out what has happened here? Why has it happened?'

'I can hear the wind blowing in my ear. I can smell burned down wood and smoke. I can feel the heat blowing on my hands.'

The polar bear in an urban environment. Photo © Maartenrus from nl.

'They took this picture to show how odd it is to have a Polar Bear in a dump rather than a Tundra biome.'

'I want to know why this Polar Bear is here.'

'People took the picture because they want to show everyone what happens. The question I want to ask is how can we let this happen?'

'What is it doing there? It is the wrong climate.'

'I want to find out why some polar bears need a biome that is just right for them. Why is it vital?'

'I have learnt more about global warming and what will happen in the future.'

'We think that there will only be bits of the rainforest in 100 years.'

'I learnt that climate change can affect Earth's atmosphere.'

'I have learnt that our world will change. Maybe not for the good of it. We need to do something to make this situation better.'

'I have learnt that global warming is affecting the North Pole because the ice is melting because the climate is getting warmer.'

'I have learnt that Brazil's trees are very quickly getting chopped down.'

Figure 1: Pupil responses to images of climate change issues.

When reflecting on their comments, I realised that the images had really encouraged the pupils to think about physical changes to our world. As one pupil said: 'I have learnt that physical maps rarely change, but when they do it is quite drastic'.

Conclusion

Geography teachers should consider using pictures to get a thinking exercise or enquiry started. With the demands of the curriculum, this approach offers a way to make pupils look more deeply into a question and use thinking skills in representing what they have learned.

Reference

Mackintosh, M. (2011) 'Graphicacy for life', *Primary Geography*, 75, pp. 6–8.

WEB RESOURCES

John Berger's 'Ways of Seeing': *waysofseeingwaysofseeing.com/ways-of-seeing-john-berger-5.7.pdf*

Download responses to using images in learning: *www.geography.org.uk/pg*

Download a PowerPoint of the images used: *www.geography.org.uk/pg*

TASC wheel: *https://www.tes.com/teaching-resource/thinking-actively-in-a-social-context-wheel-guide-6321271*

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WEATHER GLOSSARY

COMPILED BY PAULA OWENS

Paula, with the help of the Met Office website, offers the meanings of words and phrases (some of which appear in this issue) to help you and your pupils to talk about the weather.

Use the glossary to create 'word' and 'description' cards and give them to pupils to create games and become familiar with the correct terminology to use in weather lessons (download the Word version). Challenge your pupils to discover other weather phenomena, for example, 'Where in the world do ice pancakes form?' and 'What kind of winds would we find in mountain ranges?', or to research what different acronyms mean (e.g. ENSO, ITCZ). As a homework task, pupils could compile a list of local words or phrases (see Gaelic words) that their family use to describe particular weather phenomena.

Aerosols: Tiny particles that remain floating around in the air.

Air temperature: A measure of how hot or cold the air is.

Altitude: Height as measured above sea level. Altitude affects the weather, because temperatures decrease with height as the air is less dense and does not hold heat as easily.

Anemometer: A device used to measure wind speed.

Anticyclone: A large-scale high-pressure system (or 'High') where the atmospheric pressure at the surface of the planet is greater than its surrounding environment. Anticyclones are associated with calm weather. High-pressure systems rotate clockwise in the northern Hemisphere and anti-clockwise in the southern Hemisphere.

Atmosphere: The mixture of gases that surround Earth and which have remained relatively stable for the last 200 million years. The atmosphere is divided into five layers (troposphere, stratosphere, mesosphere, thermosphere and exosphere) with most of the weather and clouds found in the troposphere, the lowest layer.

Atmospheric gases: The gases that make up Earth's atmosphere. The main ones are Nitrogen (78%) and Oxygen (21%). The remaining 1% is made up of 0.9% Argon and 0.04% Carbon dioxide, plus trace amounts of Neon, Helium, Methane, Krypton, Hydrogen and water vapour.

Atmospheric pressure: A measure of the 'weight' of air pressing down on Earth's surface. Where air is rising we see lower pressure at Earth's surface and where it is sinking we see higher pressure.

Barometer: A device used to measure atmospheric pressure, which also indicates other changes in the weather.

Beaufort Scale: A measure to classify the strength and intensity of the wind. Download the history and full description of the Beaufort Scale at: www.metoffice.gov.uk/binaries/content/assets/mohippo/pdf/b/7/fact_sheet_no._6.pdf

Biome: A community of living things in a large ecological area that share similar characteristics and climatic influences (e.g. a desert).

Biosphere: The part of Earth made up of living organisms (animals and plants), whether in the atmosphere, the ocean or on land

Black ice: A thin coating of ice that forms when supercooled drizzle or rain hits a cold surface or when non-supercooled liquid comes into contact with a surface that is well below 0°C. When black ice forms on roads or paths the colour of the surface beneath it is visible.

Blizzard: Occurs when moderate or heavy snow is falling, there are wind speeds of 48kph (30mph) or more and visibility is 200m or less.

Climate: The long-term weather patterns of a region or different regions. Climate is measured in terms of average seasonal precipitation (rain or snow fall), maximum and minimum temperatures, hours of sunshine, levels of humidity and the frequency of extreme weather events over a given period (the World Meteorological Organisation standard is a 30-year average).

Climate change: A large-scale, long-term, shift in the global mean and variable climate for an extended period of decades or more.

Cloud: These form when tiny drops of water or ice crystals settle on particles (aerosols) in the atmosphere. The droplets are so small (have a diameter of one-hundredth of a millimetre) that each cubic metre of cloud will contain 100 million droplets. There are many different types of cloud (including cumulonimbus, cirrus and altocumulus) and even a Cloud Appreciation Society. View the cloud-spotting guide at: www.metoffice.gov.uk/learning/clouds/cloud-spotting-guide or download the cloud fact file at: www.metoffice.gov.uk/binaries/content/assets/mohippo/pdf/library/factsheets/fact_sheet_no._1_clouds.compressed.pdf

Carbon dioxide (CO_2): This naturally-occurring gas found in Earth's atmosphere is also a by-product of human activity (such as burning fossil fuels). CO_2 is the principal anthropogenic (caused by humans) greenhouse gas.

Condensation: When water vapour comes into contact with a surface that is at or below the dew-point, it turns back into liquid (also known as dew).

Cumulonimbus: A heavy, dense cloud that can grow very tall – often with an anvil-shaped plume – and is associated with rain, thunder and lightning. It is the only cloud type to produce hail.

Cyclone: A large-scale air mass that rotates inwards around a strong centre of low atmospheric pressure.

Desert: Any area, cold or hot, that receives less than 250mm of rainfall a year.

Dew point: The temperature at which the air, when cooled, will become saturated.

Drizzle: Rain that is smaller than 0.5mm in diameter, usually falling at rates of 2mm per day or less.

El Niño: A large-scale weather phenomenon associated with unusually warm water. El Niño events occasionally form across much of the tropical eastern and central Pacific Ocean every few years as part of a naturally occurring cycle. Both El Niño and La Niña events are accompanied by major changes in the winds and pressure patterns across the tropical Pacific.

Enhanced global warming: Occurs when the greenhouse gases released into the atmosphere from human activity trap more heat, causing global temperatures to rise, which results in rapid climate change.

Equatorial climate: Describes a region that experiences hot average yearly temperatures and high monthly precipitation.

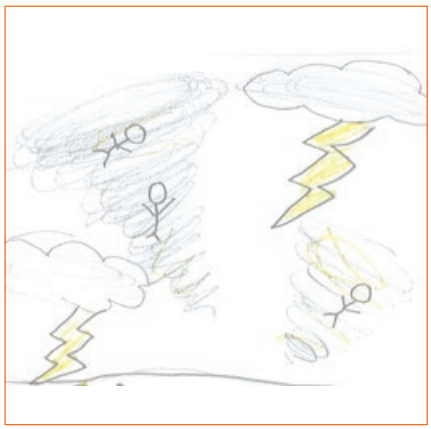
Extreme weather events: Weather that is unusual, unpredictable, unexpected, unseasonal or severe compared with what has occurred in the past or is found in historical records.

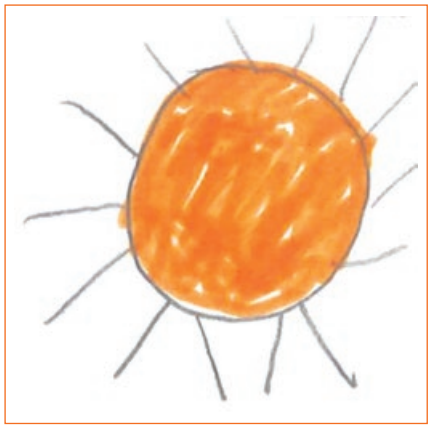
Flash flood: These occur when rain falls and/or snow melts so fast that the underlying ground becomes saturated and the water cannot drain away fast enough.

Flood: A huge amount of water, submerging a usually dry area.

Fog: Caused by tiny water droplets suspended in the air. Fog is basically a cloud at ground level that reduces visibility to less than 1000m.

Freezing rain: When rain droplets fall through air with a temperature below 0°C and then freeze (form ice) on impact with the ground.





Frost: Occurs when cool air causes water vapour in the air to condense and form droplets on surfaces with a temperature below 0°C. When the moisture freezes into ice crystals, this is known as the 'frost point'.

Global warming: While this is a natural process that makes Earth just the right temperature for life (as we know it) to exist, enhanced global warming is the acceleration of this process due to human activity.

Greenhouse effect: Most infra-red radiation given off by Earth escapes out into space, which has a cooling effect on the planet. However, some heat is trapped by gases in Earth's atmosphere, resulting in a warming effect across the globe.

Greenhouse gases: Gases (e.g. CO_2, methane, nitrous oxide) in the atmosphere that absorb the thermal infra-red radiation emitted by Earth's surface, the troposphere and clouds.

Gulf stream: A warm current that originates in the Gulf of Mexico and (together with the North Atlantic Drift) crosses the Atlantic Ocean. It transports heat from low to high latitudes and keeps northwest European winter temperatures higher than they would otherwise be.

Hail: A form of precipitation falling as round or irregularly-shaped pieces of ice (known as hailstones) that start as small ice particles or frozen raindrops. These particles get caught inside Cumulonimbus clouds, circulate and grow bigger until the cloud can no longer support their weight, so they fall to Earth.

Heatwave: An extended period of very hot weather relative to the expected conditions of the area at that time of year.

Humidity: The amount of water vapour in the air.

Hurricane: Tropical storms over the Atlantic and northeast Pacific become known as hurricanes when winds reach 119kph (74mph).

Jet stream: These ribbons of very strong winds, found 9-16km above Earth's surface, can reach speeds of 322kph (200mph) and move weather systems around the globe.

La Niña: This large-scale weather phenomenon is characterised by colder than usual surface ocean temperatures circulating in the tropical East Pacific.

Lightning: A giant spark of electrical energy within or between clouds or between a cloud and the ground.

Met Mark: An award from the Royal Meteorological Society and Met Office to recognise excellence in weather teaching.

Microclimate: The distinctive climate of a small urban or rural area, such as a garden, park or valley.

Mist: A suspension of water droplets in the air resulting in a visibility greater than 1000m.

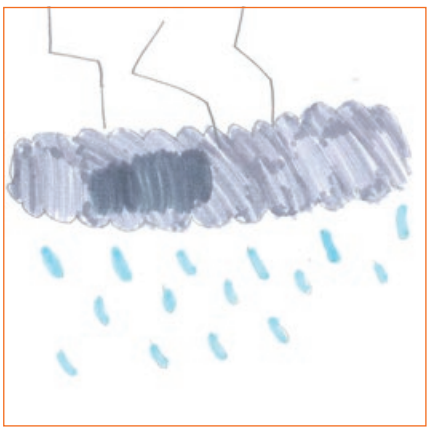
Monsoon: A seasonal change from dry to wet associated with the onset of heavy rains, usually in South East Asia.

Northern lights: Light displays (also known as Aurora Borealis) produced by the collision of charged solar particles (emitted from the Sun) as they interact with Earth's magnetic field in the North Polar region.

Okta grid: A grid that is used to estimate cloud cover.

Precipitation: Any form of water (liquid or solid) falling from the sky. This includes rain, sleet, snow, hail, drizzle and freezing rain.

Rain: A form of precipitation that occurs when the water in the air condenses. Warm air can hold more water than cool air, so when warmer air is cooled the moisture condenses to liquid and it rains.



Rainbow: An arc-shaped band of coloured light caused by the refraction, reflection and dispersion of sunlight in water droplets.

Sleet: Raindrops that have frozen before they hit the ground (or us!) Usually occurs with freezing rain.

Snow: A solid precipitation of tiny ice crystals at temperatures well below 0°C, but as larger snowflakes at temperatures near 0°C.

Snowflake: Occur when tiny droplets of super-cooled water freeze in the sky to create an ice crystal. When the air temperature is near 0°C these ice crystals clump together to form snowflakes. Snowflakes (see www.metoffice.gov.uk/learning/snow/snowflake) have six sides or points because of the way they grow: as they float around in the air, the ice crystals join together in the most efficient way: as hexagonal structures.

Storm: A violent disturbance of the atmosphere with strong winds (typically 88–119kph or 55–72mph), thunder and rain.

Sunshine: Energy from the sun (solar radiation) falling on Earth. Levels of sunshine are measured in different ways. Read about them at www.metoffice.gov.uk/guide/weather/observations-guide/how-we-measure-sunshine

Thermometer: A device used to measure temperatures.

Thunder: A sound that occurs with lightning. A lightning strike heats the air to temperatures of up to 30,000°C almost instantly, causing the air to expand into the cooler air surrounding it. We hear the resulting shockwave as a thunderclap.

Tornado: A rapidly rotating column of air, formed in unsettled weather, which reaches between the base of a storm cloud and Earth's surface.

Trade winds: The prevailing pattern of easterly surface winds found in the tropics.

Tropical cyclone: A large-scale low-pressure system over tropical or sub-tropical waters, with winds at low levels, which can cause immense damage to people and property. Tropical cyclones circulate anti-clockwise in the northern hemisphere and clockwise in the southern hemisphere.

United Nations Framework Convention on Climate Change: In 1992, countries around the world accepted this framework for international co-operation in combatting climate change. The aim of the UNFCCC is to limit average global temperature increases (and the resulting climate change) and cope with the impacts that were, by 1992, inevitable. There are now 197 Parties to the Convention and 192 Parties to the Kyoto Protocol. Find out more at http://unfccc.int/2860.php

Water vapour: Tiny gaseous particles of water in the air that we cannot see.

Weather: Daily elements of the atmosphere such as temperature, wind and rain, which can change hour by hour.

Weather front: The boundary between two bodies of air with different temperature and humidity, e.g. between warm moist air and cooler drier air.

Weather Observation Website: An online platform for the sharing of current weather observations. WOW Schools is a project to help inspire and educate a new generation of scientists through supported use of weather recording and observation http://wow.metoffice.gov.uk.

Weather report: A snapshot of the climate at a given time and place.

Weather vane: A device used to measure the direction of the wind.

Wind: Is the movement of air caused by differences in air pressure. Air tends to move from areas of high pressure to ones of low pressure. Wind direction always describes the point on the compass scale a wind is blowing from. Winds can be gentle (breeze) or very violent (tornado) – see Beaufort Scale. Different types of wind are related to the topography (land shapes) they flow over (e.g. Anabatic), the areas they flow from (e.g. Trade Winds) or the effect they have (e.g. Föhn effect). Find out more at www.metoffice.gov.uk/learning/wind

Gaelic weather words

There may be weather words that are unique to your local area. The following Gaelic words and phrases were supplied by Anne Graham, Head teacher of Sgoil Bhaile a' Mhanaich, Isle of Benbecula, Western Isles, Scotland.

Bad weather words

aognaidh – bad outlook
grod – horrible or rotten day
gruamach – bleak, gloomy
mosach – wretched
sgrathail – horrible
sgriosail – awful
uabhasach – terrible

Rain

an dearrsach – soaking rain
an t-uisge – rain
bog fluich – very wet
boinealaich – drops of rain
dìle uisge – heavy rain
fluich – wet
frasan – showers
frasach – showery
meall – shower
meallach – showery

Snow/hail/fog

ceò – fog/mist
ceòthach – foggy/misty
clachan-mheallain – hailstones
sgòthach – cloudy

Storm

dealanach – lightning
tàrneanaich – thunder

Sun

breagha – nice (day)
grianach – sunny
snog – nice (day)
tioram – dry (day)

Temperature

blàth – warm
fuar – cold
reòite – freezing
teth – hot

Wind

fiadhaich – rough/wild
gaoth – wind
garbh – windy
gèile – gale
stoirm – storm

Acknowledgements

Thanks to the UK Meteorological Office for guidance; their website (see web panel) provided much of the information for the definitions. Thanks also to Margaret Mackintosh for liaising with Anne Graham on the Gaelic words, and to pupils at Marpool Primary School, Exmouth, for their lovely drawings.

WEB RESOURCES

Download a Word version of this glossary: *www.geography.org.uk/pg*
Met Office: *www.metoffice.gov.uk*

PRIMARY

GEOGRAPHY IN PRACTICE

This page offers further ideas for using the contents of this issue of *Primary Geography* in practice in your classroom. Share your ideas inspired by this journal on Twitter @The_GA #PriGeogJournal

Article	In practice
The Start Gallery: Reading the weather	• Try the simple use of books to promote language and understanding of weather concepts, using titles from the downloadable list • Use *The Everyday Guide to Primary Geography: Story* (www.geography.org.uk/shop) to enhance your use of stories in your teaching
Extreme weather	• Most places will have extreme weather events that have affected the people who live there. Invite local people in who can share their memories through spoken words and images and create an exhibition linking geography, history and literacy
Writing the flood	• Create everyday poetry about the weather experienced in the school grounds throughout the year and display it in the school grounds. Write it on boards, on walls or on the ground, using permanent materials or temporary ones such as chalk
Wild weather!	• Have a weather image of the week and invite pupils to add their own questions
Weather and climate in the curriculum	• Find out more about weather and data recording, including weather investigations that can be carried out in the school grounds and local area in Knight, S, (2013) 'Investigating weather through fieldwork', *Teaching Geography*, 38, 2, pp. 72-4
Reacting to the Weather	• Build up recommendations for sources about global weather from a report on the Met Link International weather observation project in Knight, S. (2008) 'Watching the weather around the world', *Teaching Geography*, 33, 3, pp. 137-9 • Use the NASA website to explore a wealth of imagery from space showing weather systems across the globe: www.nasa.gov
The *Primary Geography* Interview	• Make and create a wonder wall of words describing in detail the natural world that you see around you • Go on fieldtrips, make bird hides and become watchful or just explore the school grounds in search of the everyday and the exquisite
Can we play outside today?	• Visit the British Council website: www.britishcouncil.org to find out how to make and develop mutually valuable links with a school overseas • Investigate the Global Learning Programme website: http://glp.globaldimension.org.uk • Create your own class set of weather images that show the story of your local weather
Energy matters!	• The GA has some free online CPD to help you get started with teaching about climate change: www.geography.org.uk/Young-geographers-go-green-online-cpd
A climate change assembly	• Award prizes in assembly for the weather watcher of the week, or the class with the most responsible weather use • Christian Aid have some resources for assemblies: www.christianaid.org.uk/schools/climate-change-and-sustainability-assemblies
A week of rain…	• What can we learn from the way first-hand experience is used to bring experiences alive? • There are techniques used in Special Schools that are also effective and valuable in mainstream settings: where is the joy in your learning?
Get in the picture about climate change	• See *Primary Geography* Autumn 2009, Issue 70, which focused on graphicacy and is packed full of ideas for using imagery, maps, graphs and other visual stimuli: www.geography.org.uk/pg
Weather glossary	• Develop your own top weather words as a class (you could adapt the number for different age groups). Challenge groups to brainstorm, describe and draw their own illustrations for a poster or book and give each group a section of the alphabet to focus on • What local weather words can you find?

SuperSchemes:
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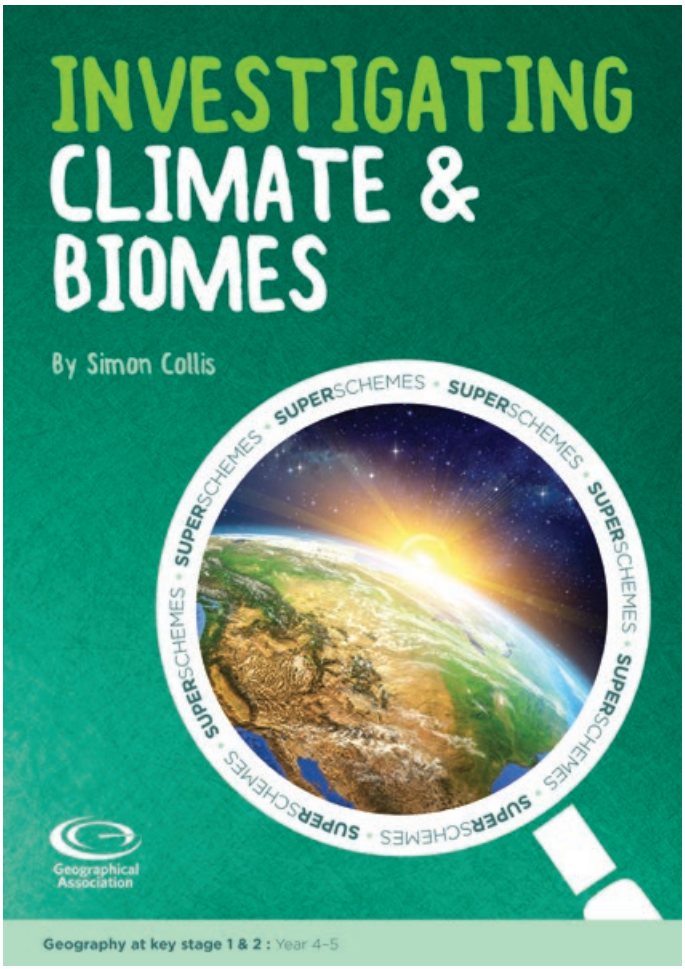

This book will enable all primary teachers to teach good geography about climate and biomes. The unit of six lessons aims to help pupils to understand the difference between climate zones and biomes. Pupils will extend their knowledge by mapping the climate zones and biomes, and using graphs, predictions and scientific experiments to understand and describe how distance from the equator affects climate around the world. Pupils will also learn about the plants, animals and climate within five of the world biomes, investigate their connections and interdependences, and begin to explore the effects of climate change on the world's climate zones and biomes.

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