**Edina Trust Bulb Project Extension  
Guidance Teachers and Project Leaders on this Year’s Results**

**A big thank you!**Well done to all schools that sent data for the Bulb Project this year! Your input has been invaluable in looking at our hypotheses. Even if you did not manage to get data to us this year we hope that this project has been fun and useful for teaching various curriculum topics. We have a **quick survey online** where we would love to get your feedback:   
[**https://www.surveymonkey.co.uk/r/XYLLGWG**](https://www.surveymonkey.co.uk/r/XYLLGWG)

The National Museum of Wales (NMW) will produce a paper on the results of the bulbs planted in pots for all schools. This will be distributed to the schools involved and can be accessed on the NMW website: [www.museumwales.ac.uk/spring-bulbs/](http://www.museumwales.ac.uk/spring-bulbs/)

This year 100 schools took part in the Edina Trust’s extension Bulb Project, which involves comparing the flowering dates and heights between bulbs planted in pots and bulbs planted in the ground. **A big thank you to the schools that returned their flowering data!**

**Table 1: Data sets for the Edina Trust Bulb Project Evaluation**

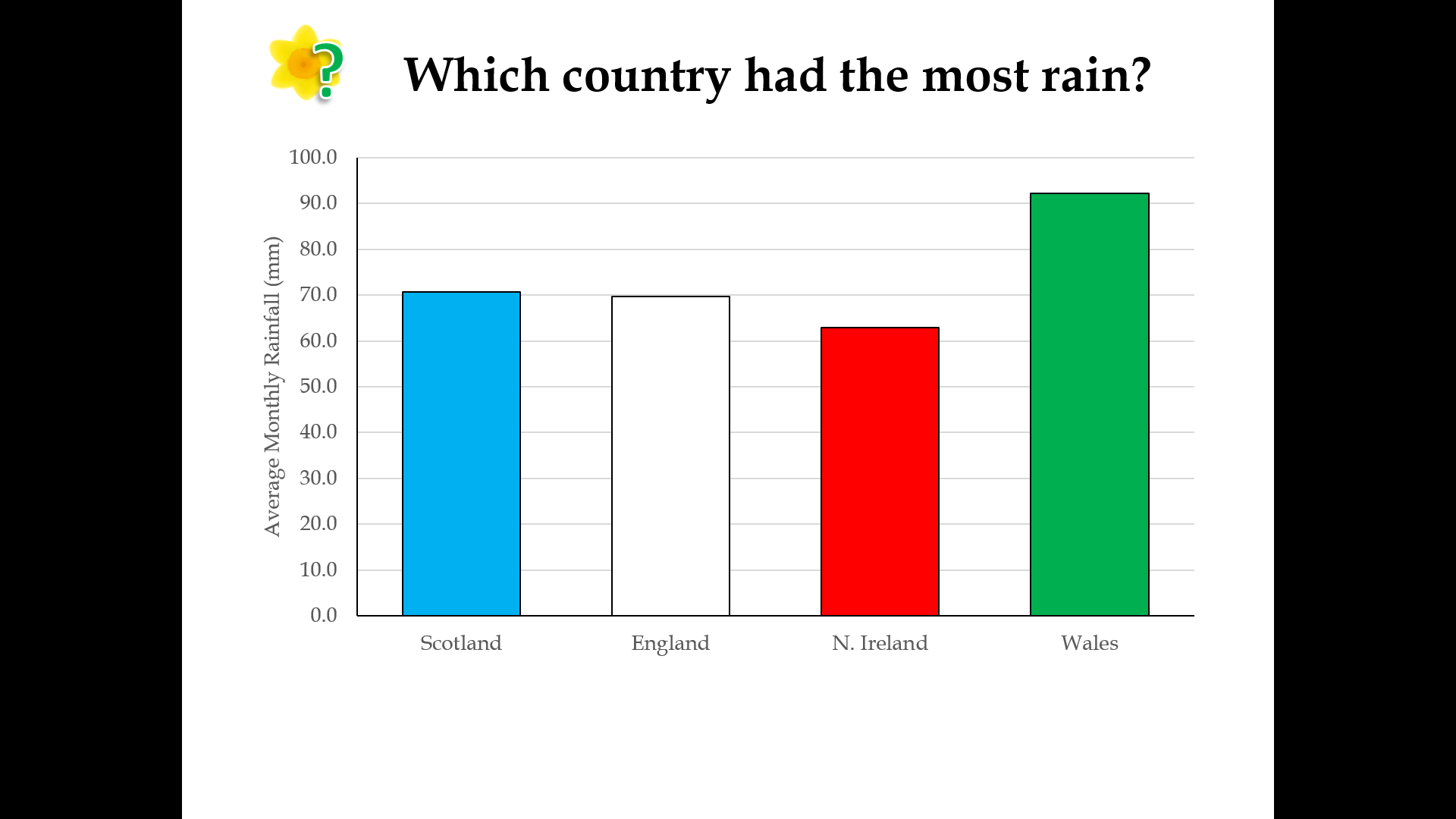
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Schools in Extension Project** | **Schools in Scotland** | **Schools in England** | **Schools in Nor. Ireland** | **Schools in  Wales** |
| All Schools | 101 | 42 | 39 | 11 | 9 |
| Schools that provided flowering data | 38 (38%) | 9 (21%) | 16 (41%) | 1 (9%) | 4 (44%) |

The 38 schools provided flowering dates and heights for 1,170 daffodils. The amount of data is significantly lower than normal because most schools needed to close before the end of the project and before their bulbs flowered. This could have affected the reliability of the data, especially in Northern Ireland where we only had results from one school, which could be an interesting point for discussion. In the following analysis, local authorities have been divided into the four countries:

* **Scotland**: Dumfries & Galloway, Dundee, East Ayrshire, Fife, North Lanarkshire, Renfrewshire, Scottish Borders, South Lanarkshire, West Dunbartonshire
* **England**: Hull, Lancashire, Lincolnshire, North East Lincolnshire, Oxfordshire, Sunderland, Wakefield, Wolverhampton
* **Northern Ireland**: Belfast, Derry/Londonderry & Strabane
* **Wales**: Blaenau Gwent, Caerphilly, Conwy, Rhondda Cynon Taf

The following pages contain further details on the results, which you can use alongside the PowerPoint presentation to share the results with pupils. If your school is still closed, pupils could work through the PowerPoint by themselves or you might consider sharing the presentation with the class e.g. by a Zoom meeting.

**We have also created some fun quizzes that pupils can do by themselves, which don’t require them to use PowerPoint. You can find more information on page 9!**

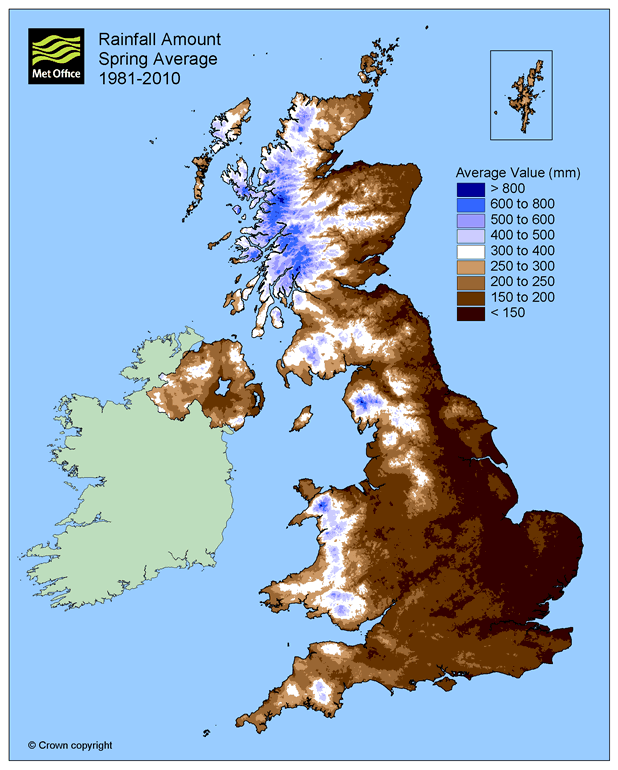


|  |  |
| --- | --- |
| Country | Average rainfall (mm) |
| UK 2019 | 73.9 |
| Scotland | 70.6 |
| England | 69.6 |
| N. Ireland | 62.9 |
| Wales | 92.2 |

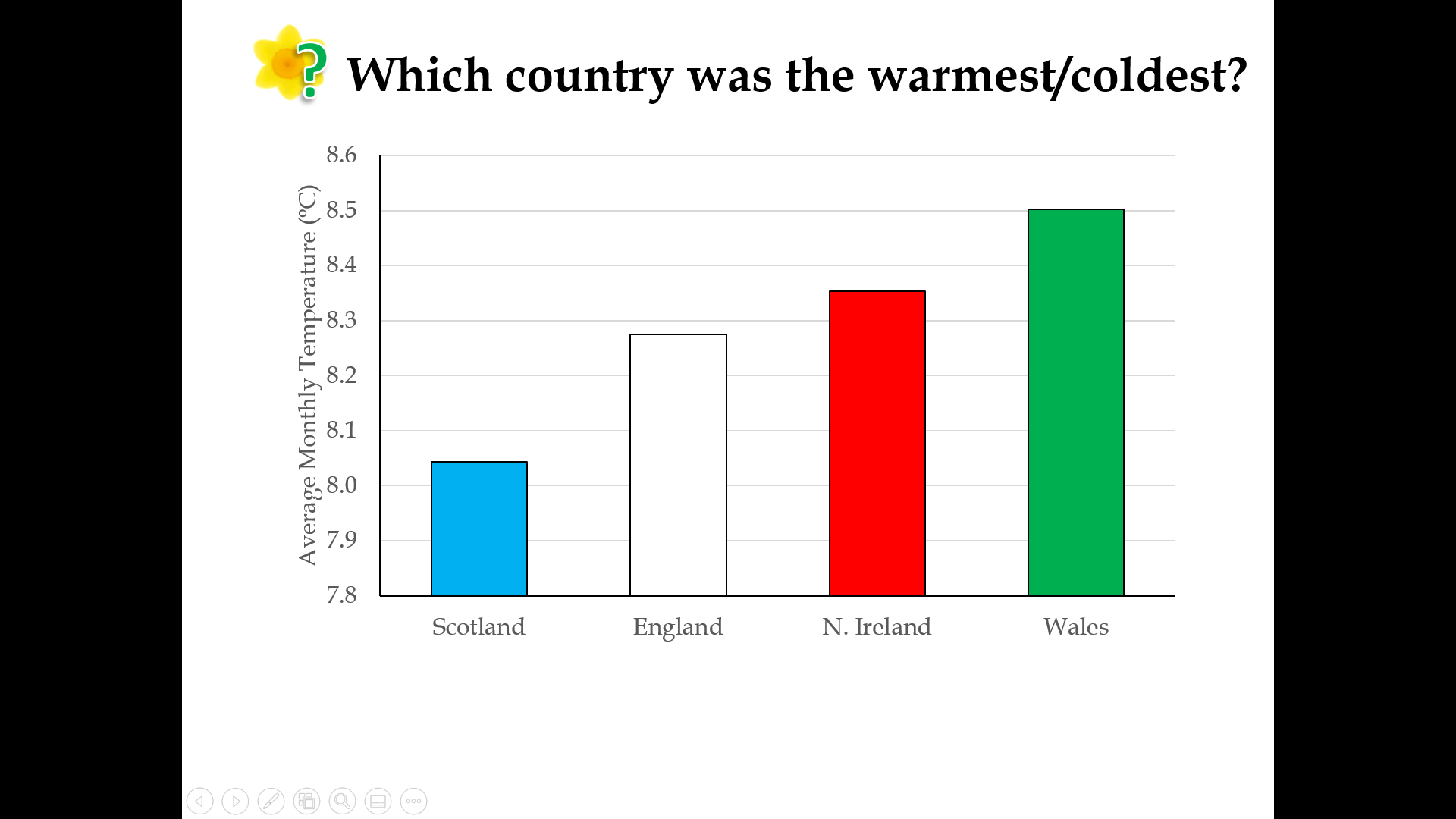
**Wales** had the most rain this year. To the right are the actual figures for each country, plus the combined average for the UK, as recorded by the schools taking part in the Bulb Project.

Wales being the rainiest area is not surprising – see the map below from the Met Office. The west of Scotland, North-West England, and Wales have the most rainfall on average in Spring.

<https://www.metoffice.gov.uk/public/weather/climate>



Water is of course vital for plants, but more rain does not always mean that daffodils will thrive. Daffodils will not grow underwater! Being too moist also benefits moulds that are detrimental to the daffodil bulbs.



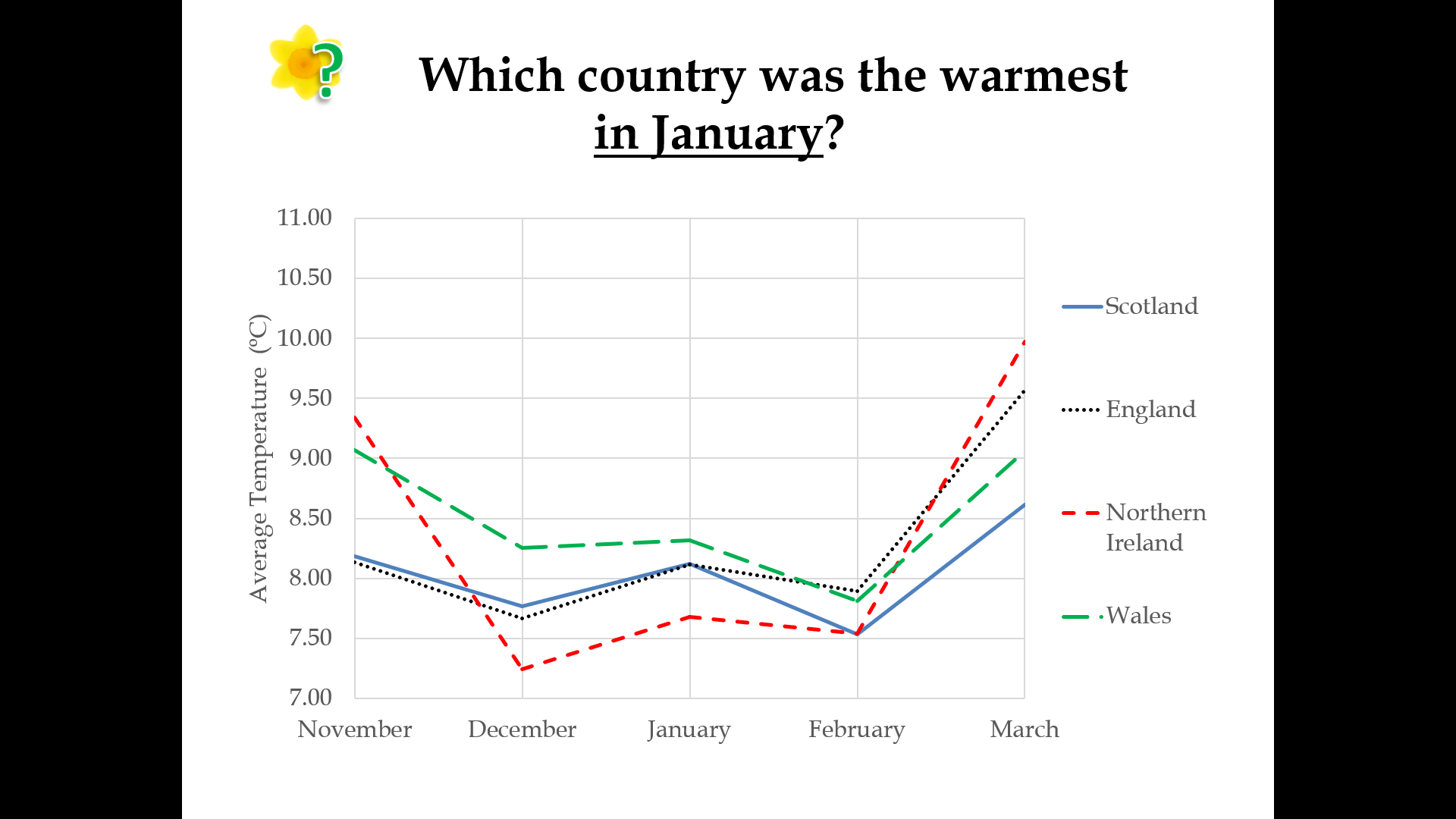
**Wales** was the warmest country this year on average, although a statistical test revealed that the temperatures were all so close that there was no significant difference. Scotland was once again the coldest area. This is due to its higher latitude. Another factor, although it probably wouldn’t affect children taking their weather recordings during the day, is that Scotland being further north has fewer daylight hours during the winter. South Wales and South England can also benefit from warm, tropical winds coming from the south, whereas Scotland gets cold Arctic winds coming from the north.

|  |  |
| --- | --- |
| Country | Average Temperature (°C) |
| UK 2019 | 8.29 |
| Scotland | 8.04 |
| England | 8.27 |
| N. Ireland | 8.35 |
| Wales | 8.50 |

The table to the right shows the actual values for the average temperature in each country and across the UK.

Bulbs are sensitive to temperature changes and begin to grow as the soil warms up in spring. This means that a mild winter can cause daffodils to flower earlier, or a cold spring can cause them to flower later.

As with rainfall, it is not always good to be too warm. As well as potential drought, too much warmth can be beneficial to pests such as the Large Narcissus Fly. The fly’s larvae live inside and eat daffodil bulbs. Due to the warmer climate this fly, which was once only found in the South-West, has been able to spread across the UK[[1]](#footnote-1).



This graph shows the temperature each month from November 2019 – March 2020. We can see there was a big drop in January in all four countries, followed by a jump in temperature in February. Below are the average temperatures each month in the four countries:

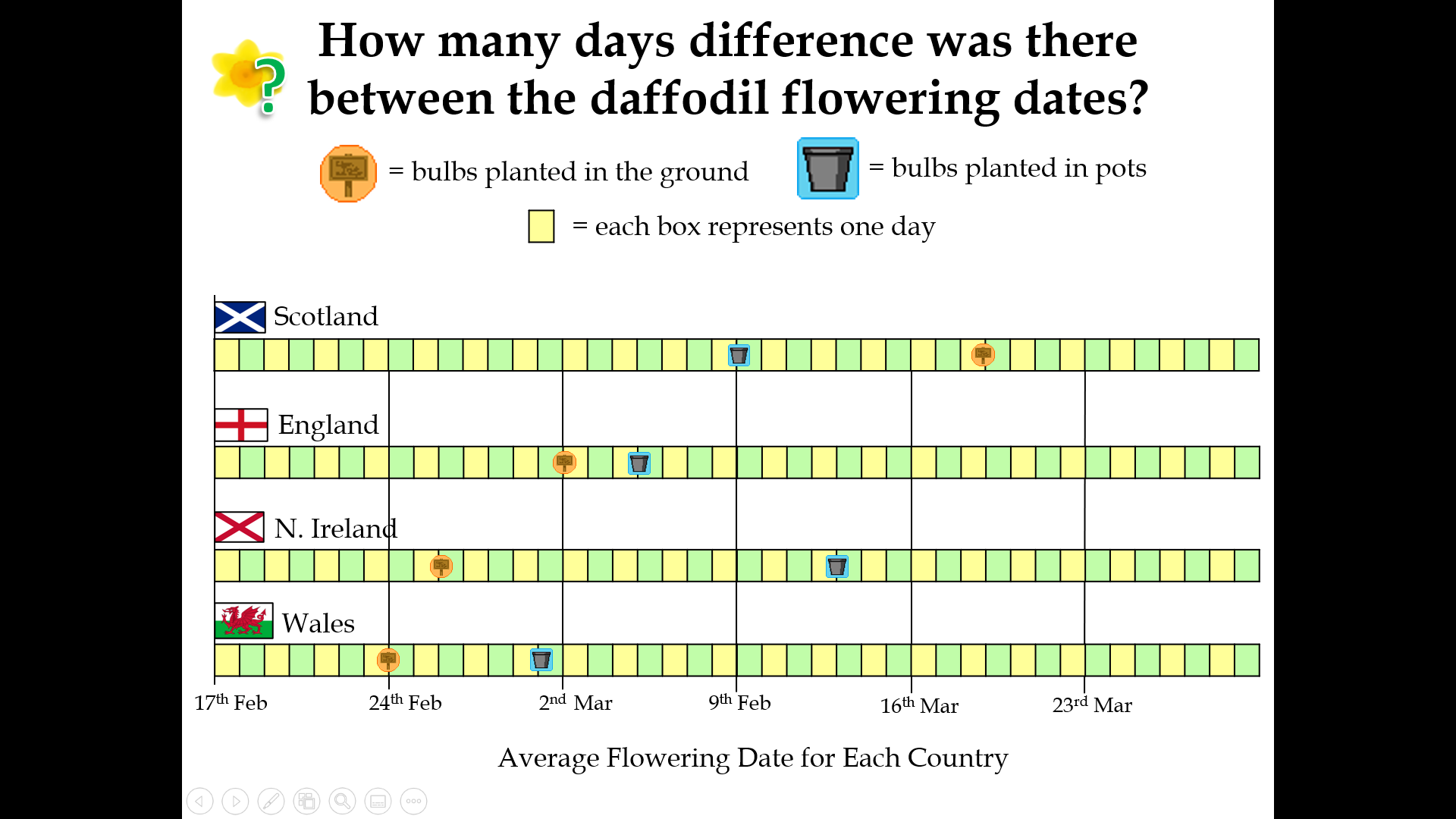
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ºC | November | December | January | February | March |
| Scotland | 8.18 | 7.76 | 8.12 | 7.53 | 8.62 |
| England | 8.13 | 7.66 | 8.11 | 7.89 | 9.57 |
| N. Ireland | 9.34 | 7.24 | 7.68 | 7.54 | 9.97 |
| Wales | 9.07 | 8.25 | 8.32 | 7.81 | 9.06 |

Looking at January in particular, Wales was the warmest. England and Scotland were the same temperature (only a 0.01ºC difference) while Northern Ireland was the coldest. However, by March, Northern Ireland was the warmest country!

Our hypotheses

Next, we look back at our hypotheses – our predictions about daffodils’ flowering and height:

1. Schools that record higher temperatures during the Bulb Project will have the earliest flowering daffodils. The effect of temperature will be more pronounced with the daffodils in pots compared to those in the ground.
2. Schools that record more daily rainfall during the Bulb Project will have the earliest flowering daffodils.
3. On average, daffodils in pots will flower before those planted in the ground.
4. Schools in areas with higher temperatures will record taller daffodil flowering heights.
5. Schools in the area with the highest level of rainfall will record taller daffodil flowering heights.

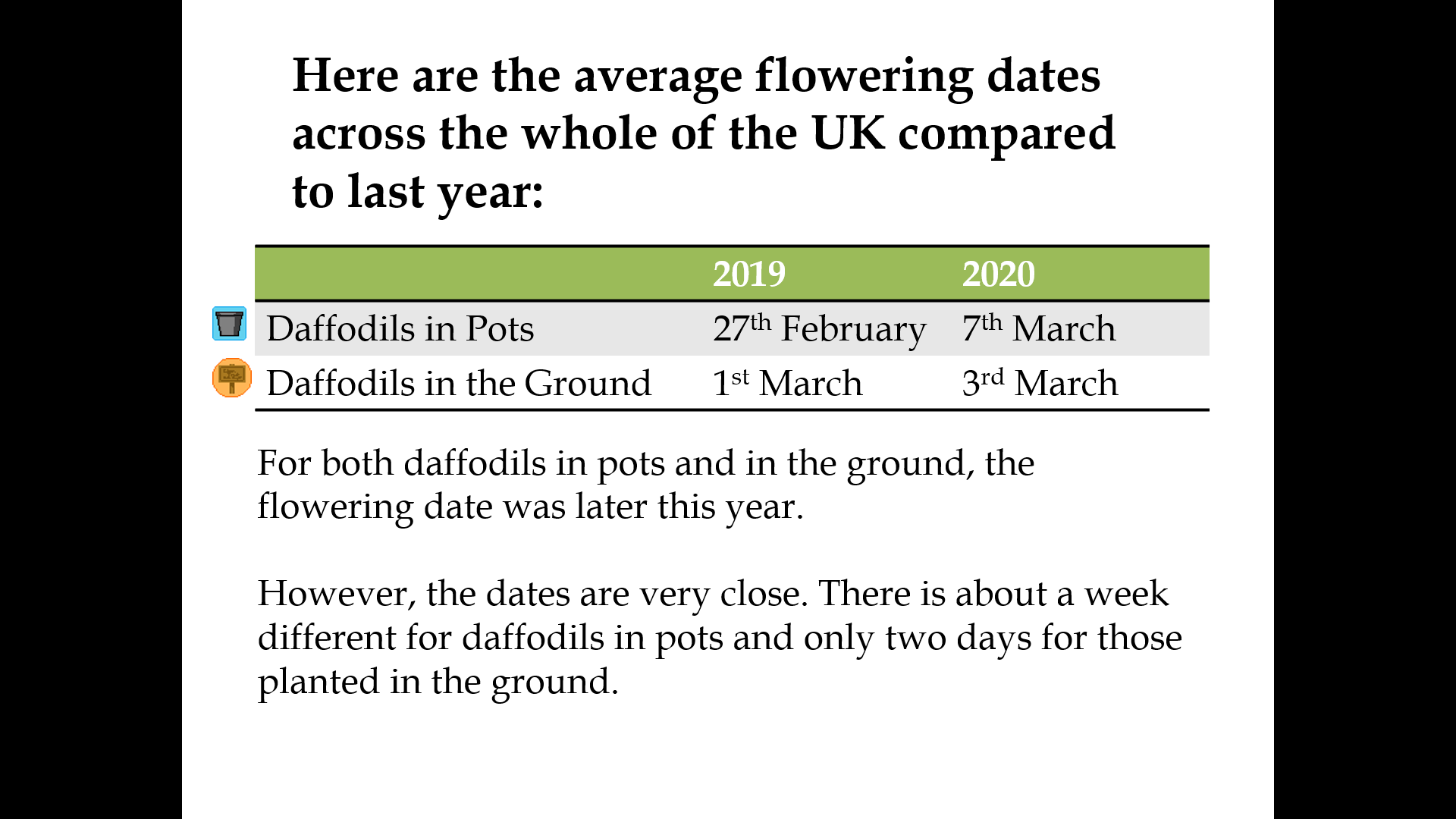


|  |  |  |
| --- | --- | --- |
|  | Pots | Ground |
| Scotland | 9th March | 19th March |
| England | 5th March | 2nd March |
| N. Ireland | 13th March | 26th Feb |
| Wales | 1st March | 24th Feb |

Daffodils flowered first in Wales, followed by Northern Ireland, England, and Scotland was the latest this year. The average flowering dates are listed in the table to the right.

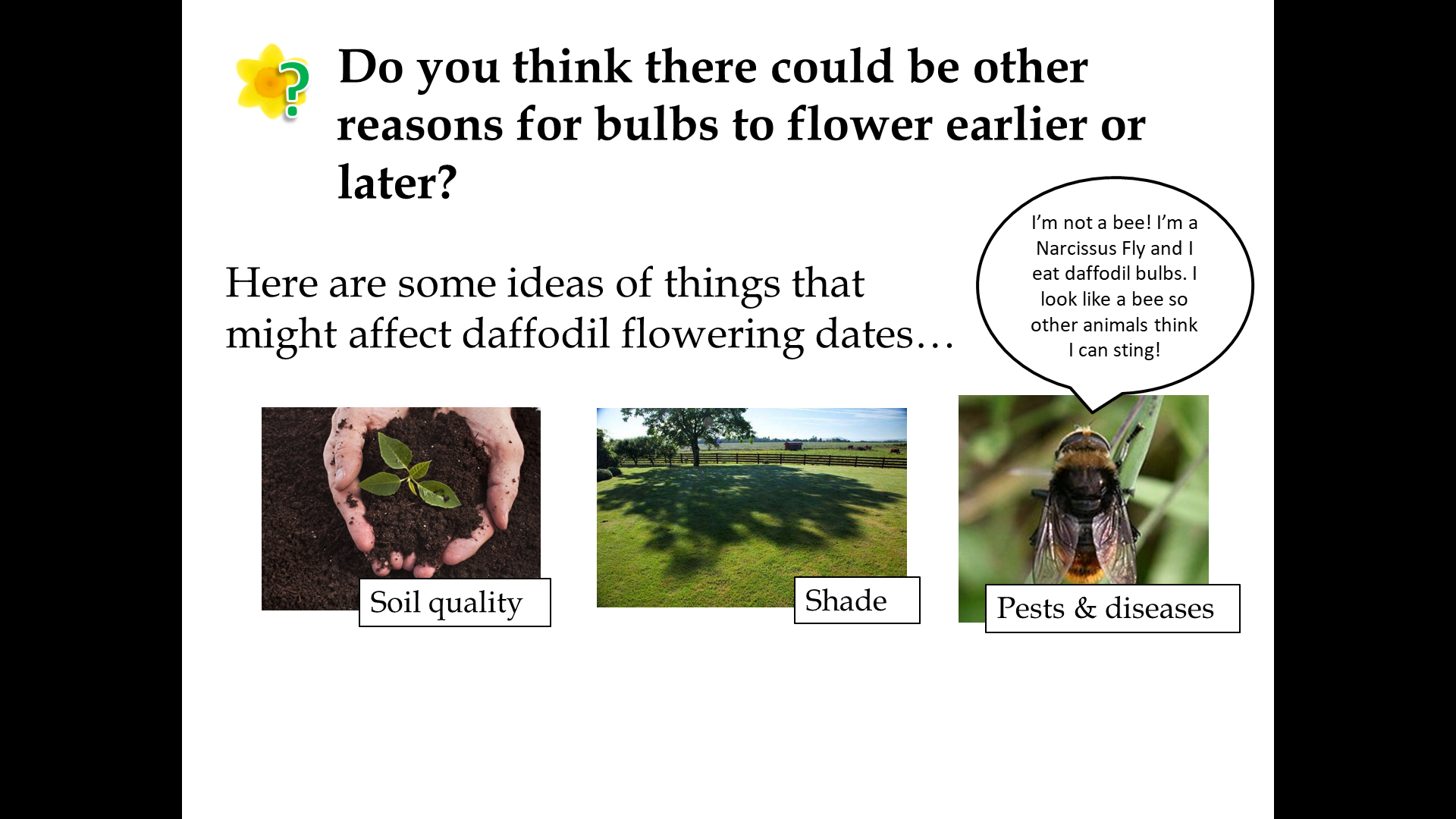
Our hypothesis was that daffodils in pots would flower first. This did happen in Scotland, but not in any other country.

We expected that the bulbs in pots would be less insulated from changes in temperature and therefore bulbs in pots in the warmest area would flower much earlier than those in the ground, and in the coldest area there would be less of a difference. However the data does not support our hypothesis. It raises further questions as to what other factors had enough impact to override the temperature difference. We will come back to these other factors later.



The slide shows the difference in flowering dates between bulbs in pots and in the ground, and between Spring 2019 and Spring 2020. These are the average flowering dates across the whole UK.

To the left is a graph showing the temperatures sent in by schools during the last three years of the Bulb Project. You can see that 2019-20 has been the warmest on average, yet daffodils flowered later this year. Possibly this was because the amount of rain or some other factor was more important, and/or the overall results have been affected by the lower number of schools sending in data.



The slide shows some of our ideas for other factors that might be affecting the growth of the daffodils. They might explain why the results don’t always match our predictions.

1. Soil Quality

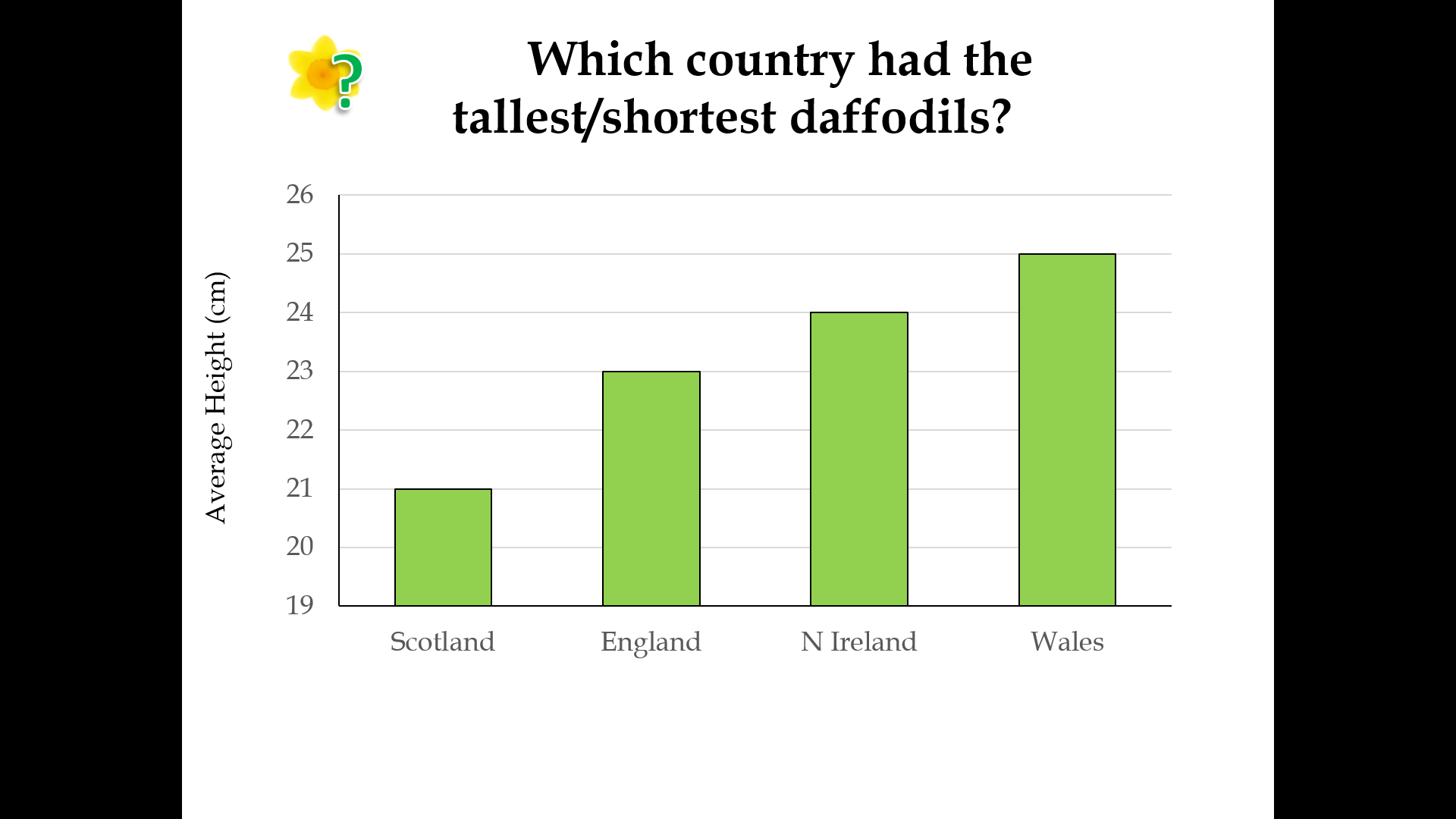
We cannot be sure how much of an effect the type of soil or compost has on the growth of daffodils. Compost will hold moisture more effectively than soil, and different types of compost will hold moisture more effectively – we recommend peat-free compost due to environmental concerns. Using compost over soil should also reduce weed growth since it should not contain any stray seeds. Good drainage is important as waterlogged soil can cause the bulbs to rot, and the pH and amount of nutrients, e.g. nitrogen and potassium, in the soil will also affect growth. We would have to find a way for all schools to use the same compost to eliminate this from our investigation.

1. Sunlight/Shade

Plants need sunlight in order to grow. Bulbs that are grown in shaded areas might grow taller in search of light, or they may not get enough sunlight to warm up and might flower later. We ask schools to keep their pots near the bulbs planted in the ground, if possible, to reduce the impact of this. There is not much else we can do as the amount of shade and hours of sunlight will differ between all schools.

1. Pests and Diseases

We don’t have much control over this. We advise schools to keep their bulbs in a cool, dry place before planting day. Let us know if you notice your flowers are affected by pests!



As shown in the chart above, Scotland had the shortest daffodils this year. Scotland was the coldest area. Wales had the tallest daffodils and was the warmest and rainiest area. This is in line with our prediction that the warmest and rainiest area would have the tallest flowering daffodils.

It is important to remember that correlation does not imply causation. However the data this year gives evidence to the idea that daffodils are affected by temperature and rainfall. This leads us to consider the impact that climate change would have on daffodils and, in turn, other types of plants whose life cycle depends on the seasons.

Mystery Bulbs

Spoilers: the mystery bulbs this year were Aliums! It’s a shame that these will have flowered while schools were closed. We would like to encourage pupils to have a look for Aliums flowering near where they live.

Follow Up Activities

1. Kahoot Quizzes

We have created some fun quizzes that pupils can complete using the website Kahoot! There are three different quizzes, relating to temperature and rainfall results sent in by pupils all around the UK. The links to these quizzes can be found at [www.edinatrust.org.uk/bp-results](http://www.edinatrust.org.uk/bp-results)

Level One: designed for pupils aged 7-8

This quiz contains bar charts, and pupils will need to compare the amount of rainfall and the average temperature between the four countries.

Level Two: suitable for pupils aged 8 or older

The rainfall quiz is considered a bit easier than the temperature quiz as the figures are easier for pupils to compare. This quiz only contains bar charts.

The temperature quiz contains bar charts and line graphs. Figures are listed to two decimal places (necessary because the temperatures are so similar!) therefore we judge this quiz to be the most challenging.

This is our first time creating quizzes like these, as an activity pupils can do at home by themselves. We would love to hear your feedback!

1. Bulb Project Board Game

A professionally printed copy of this game was sent to all schools last October. However, if you direct pupils to our website linked below, they will find a board game that can be downloaded and printed. This game is designed to encourage discussion about the various factors that could have affected the growth of your daffodils and crocuses.

Please go to this web page to download the board game and instructions:

<https://www.edinatrust.org.uk/bp-results>

1. OPAL Air Survey

One of the factors that we have not looked at in the Bulb Project is the air quality. You may have read news reports that reveal quite shocking impacts that local air pollution can have on people and wildlife, for example: <https://www.theguardian.com/environment/2018/nov/05/air-pollution-everything-you-should-know-about-a-public-health-emergency>

If you are interested in the air quality around your school, there is a simple survey you can take part in that will also help provide important data to scientists. This is done by looking at lichens and fungi that are growing around your school and OPAL provides guidance to help you identify the different species.

Please go to this web page to find out how to take part in the OPAL Air Survey: <https://www.opalexplorenature.org/airsurvey>

**Please note that the Edina Trust is not affiliated with OPAL or this Air Survey in any way, so if you have questions you will need to contact OPAL.**

1. <https://thedaffodilsociety.com/wordpress/a-guide-to-dafodils/pests-diseases/> [↑](#footnote-ref-1)