**Edina Trust Bulb Project Extension
Report for Teachers and Project Leaders**

**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/EdinaBulbs2018>

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. This year the Trust received flowering results from roughly 3 in 10 schools taking part. We hope more schools return their flowering results in future so that we can improve our analysis. **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 | 100 | 38 | 38 | 16 | 8 |
| Schools that provided flowering data on bulbs in the ground.  | 29 (29%) | 10 (26%) | 13 (34%) | 2 (13%) | 4 (50%) |

Our 42 special schools provided flowering dates and heights for 327 daffodils planted in the ground, as well as recording a total of 141 bulbs that did not flower before the end of the project. In the following analysis, local authorities have been divided into the four countries:

* **Scotland**: Dumfries & Galloway, Dundee, East Ayrshire, Fife, Inverclyde, North Ayrshire, North Lanarkshire, Renfrewshire, South Lanarkshire, West Dunbartonshire
* **England**: Lancashire, Lincolnshire, Middlesbrough, Oxfordshire, Sunderland
* **Northern Ireland**: Belfast, Derry/Londonderry, Strabane
* **Wales**: Conwy, Holywell, Rhondda Cynon Taf

**Chart 1: Number of Daffodils vs Date of Flowering (per week) – Jan-March 2017**

*Source information: Chart shows the number of daffodils flowering in weeks beginning 1st January to 26th March.*

*DNF counts the daffodils that were reported as not flowering before the 31st March.*

**Chart 1** shows that the majority of the daffodils flowered in March this year. This includes daffodils planted in the ground from all of our areas.

**Chart 2: Number of Daffodils vs Date of Flowering (per week) – 2012-2018**

*Source information: Data from all seven years of the Bulb Project, since 2011-12.*

**Chart 2** shows the following:

* Most daffodils flower in March every year.
* In 2013, 2015, and 2018 the flowering dates were delayed due to the widespread cold weather, with many daffodils reported to have flowered in April.
* In 2018 the most common time for daffodils to flower was in late March. There is a clear difference from 2017 where daffodils opened in early March.

**Hypothesis 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.

**Chart 3:** Average flowering date and average temperature – by area.

*Source information: The flowering date includes data from schools that sent in flowering information for both bulbs in the ground and in pots. The weather recordings are from the 82 schools that sent in weather recordings.*

**In all three regions, the daffodils planted in the ground flowered earlier than those planted in pots. On average, flowers in Wales opened first, and flowers in England opened last.** There was a similar temperature in England and Wales, so this would indicate that perhaps the temperature did not have a large impact on when daffodils flowered. A statistical test confirmed there was no significant correlation between the temperature and the flowering date for neither the bulbs in the ground nor in pots. **The data from the project this year cannot support our hypothesis.**

While we know that temperature does affect the flowering date of daffodils[[1]](#footnote-1), there are other factors that can have a stronger effect. For example, when schools planted their bulbs we asked for a location, including whether they were planted in a shaded area. Sunlight, soil quality, rainfall, and pests could be contributing to the flowering date. It could also be affected by schools measuring the temperature at different times of day. We would need to make the Bulb Project a lot stricter if we wanted to account for these.

**Hypothesis 2:** Schools that record more daily rainfall during the Bulb Project will have the earliest flowering daffodils.

**Chart 4:** Average flowering date and average daily rainfall – by area.

*Source information: The flowering date includes data from schools that sent in flowering information for both bulbs in the ground and in pots. The weather recordings are from the 82 schools that sent in weather recordings.*

**There is a pattern when looking at average rainfall and the average flowering date**. England had the least amount of rain per day while Wales had the most. This matches with our expectations as Wales has the earliest flowering daffodils whereas England has the latest.

A statistical test looking at the correlation between the number of days until the daffodils flowered and the average daily rainfall recorded by each school showed that **there was not a statistically significant correlation.** This is based on the amount of data available. There was a greater correlation for the bulbs planted in the ground than for bulbs planted in pots, but it was not strong enough to say it supports the hypothesis.

One additional point to note is that plants can have too much water! In previous years of the Bulb Project this has been demonstrated in areas that had an exceptionally high amount of rain, where schools reported their daffodils flowering later than areas with normal rainfall. This year schools reported a fairly average amount of rain compared to the previous six years of the project – however, a significant amount of it may have been snow this year!

**Hypothesis 3:** On average, daffodils in pots will flower before those planted in the ground.

**Chart 5:** Average flowering dates in each area, for bulbs in the ground and in pots.



We think bulbs planted in pots will normally flower first because bulbs in the ground are better insulated from changes in temperature and therefore take longer to ‘wake up’ when the weather gets warm. **However, Chart 5 shows the opposite of our hypothesis, with bulbs in the ground flowering first in all areas!** This has happened two years in a row. We wonder if this could have something to do with water drainage, or possibly the pots being kept in a different location to the bulbs in the ground, but we can’t be sure without doing more tests.

The average flowering dates across all areas were:

* 22nd March for bulbs planted in pots.
* 12th March for bulbs planted in the ground.

This means there was a difference of ten days between the averages of our two sets of data.

**Hypothesis 4:** Schools in areas with higher temperatures will record taller daffodil flowering heights.

Average Monthly Temperature (°C)

Average Flowering Height (cm)

**Chart 6:** Average temperature vs Average flowering height in each area.

*Source Information: As above, the average flowering date is from bulbs in the ground and in pots, and the temperature is taken from all of the schools that sent in their weather recordings.*

There was a surprising negative correlation between flowering height and average temperature this year, meaning that **areas with lower temperatures recorded taller daffodils**. Although a statistical test showed that this correlation was not significant for the amount of data analysed.

As explained in Hypothesis 1, temperature is difficult to analyse because it can be affected by the position of the thermometer (in the sun or shade) and the time of day temperature is measured. By averaging the data this effect should be lessened. March 2018 was ‘exceptionally cold’ and had 110% of the average rainfall across the UK[[2]](#footnote-2). This may be the case where relatively extreme weather has skewed the results. It is interesting to compare the results to last year, which had an unusually warm winter (see below).

**Hypothesis 5:** Schools in the area with the highest level of rainfall will record taller daffodil flowering heights.

Average Monthly Rainfall (mm)

Average Flowering Height (cm)

**Chart 7:** Average Daily Rainfall vs Average Daffodil Height in each area.

*Source Information: The average flowering height includes results from the 41 schools that reported the heights of their bulbs in the ground. The amount of rainfall is taken from all the schools that sent in weather recordings.*

**This year schools in Wales recorded the most rainfall.** However they did not have the tallest daffodils. There was not much difference in the heights of daffodils in Wales, Northern Ireland, and England. Scotland recorded the shortest daffodils but was also the area with the second most rain.

There does not seem to be any correlation between rainfall and flowering height this year. One factor that may be causing this is the higher-than-average rainfall in March, which could have caused daffodils in some areas to get too much water and so the results do not match with our hypothesis.

**Comparison to last year**

2016-17 was significantly warmer in all areas compared with 2017-18. This is reflected by the earlier flowering dates.

Average flowering dates (all daffodils)

2016-17: 9th March
2017-18: 17th March

**Summary**Well done to all of the 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 survey online where we would love to get your feedback:

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Now that we have looked at the various effects the weather has on the daffodils, it has made us a lot more aware of its effects on our surroundings. Thank you once again for taking part!

1. See, for example, Khodorova & Boitel-Conti, *The Role of Temperature in the Growth and Flowering of Geophytes*; Plants 2013, 2, 699-711; <http://www.mdpi.com/2223-7747/2/4/699/pdf> [↑](#footnote-ref-1)
2. https://www.metoffice.gov.uk/climate/uk/summaries/2018/march [↑](#footnote-ref-2)