



The g4g Daisy Experiment



Overview

Demonstrating the science of nature (and transpiration and cohesion) by experimenting with white daisies and showing the magic of turning them red, blue, green, purple... right before your eyes! One single daisy represents science in so many ways! Have you ever considered the physics of a flower – that blossom is heavy! What helps it to stay upright... a bit of physics perhaps?

Why is a daisy in the logo of greenlight for girls?

The reason for the daisy image is that flowers & in particular this flower is a demonstration of Fibonacci's numbers. Basically, the Fibonacci numbers are Nature's numbering system. He is known as the greatest European mathematician of the middle ages. He found that the number of petals in a flower created a numerical sequence that could be found all over nature and is the basis of quite a lot of mathematical reasoning -- still used today! Here's how the sequence begins... 0,1,1,2,3... can you guess the next numbers?!



Apart from our scientific explanation on why we have a daisy in our logo, we also like the symbolic perspective. Do you remember what one of the first things you used to draw when you were a child? When we asked our network of friends, most of us answered - a daisy! For us, the daisy is fresh, young, feminine, hopeful -- and full of math and science.

Learning Objectives

In the g4g Daisy Experiment, through hands-on practice and discussion, the student will be able to:

Scientific

- ∞ Recognise that flowers absorb colour through the process of **transpiration**. As water evaporates from flowers and leaves, the force between water molecules called **cohesion** pulls more water along. This **capillary action** keeps water in the xylem (stem).

Intrinsic

- ∞ Recognise that science (STEM) is everywhere around us & an important part of everyday life.

Thought-provoking

- ∞ Propose professions that use chemistry knowledge and the education needed for that job.

These objectives will be measured by asking questions throughout and at the end of the workshop session that identify if these objectives have been learned.



Materials needed

Here's what you need...

- 1) White daisies ****Gerbera daisies** work best (the ones with the whitish-green centre – see picture to the left)
- 2) Table with table cloths (preferably water-resistant if possible)
- 3) Thin vases, science beakers OR test tubes/watering tubes
- 4) Much food colouring
- 5) Permanent markers or pens
- 6) Labels
- 7) (Warm) water
- 8) Scissors
- 9) Optional - a clock

How to conduct the experiment

Introduction

Students will be introduced to general concepts of photosynthesis on the basis of chlorophyll. Flowers are all very pretty and younger students will be able to grasp the concept and make use of the flowers used as well. Chlorophyll being the cell that is primarily used in photosynthesis is mainly green when healthy. On flowers the location of green is mainly the stem. Otherwise there is little chlorophyll found where there is no green.

Science Topics: Scientific Method – Hypothesis, observing changes, analyzing data.

Skills: Observing, questioning, inferring, hypothesizing

Benchmarks: 1 Organisms, Forming the question/hypothesis, analyzing and interpreting results.

Lab Objectives

- ∞ Conduct experiment on the change of colour on daisies in using food colouring.
- ∞ Explain photosynthesis and chlorophyll significance in flowers
- ∞ Have students hypothesize results

Procedure

1. Lay out all the materials & daisies on the table
 - a. **SECRET TIP:** It helps if the Daisy is a little thirsty, so take them out of the water some time (but not too much!) before beginning the experiment.
2. Ask the question – what do think will happen to the daisies if water colour is changed. Will the flower change colour? Will the stem change colour? Both? Neither? Why? Let's find out!
3. Identify a vase/test tube and daisy for the girls to try.
4. Cut the ends of their daisies - this allows them to “drink” more efficiently.
 - a. **SECRET TIP!!** If you cut the stems at an angle, the experiment will work faster.
 - b. **QUESTION:** Cutting the stem shorter or longer will make the experiment go faster?
5. Fill a vase or test tube with water.
 - a. **SECRET TIP!!** Make sure the water is warm (not hot) and the experiment will work faster. Why do you think this is?



- b. **QUESTION:** Do you think a lot of water or a little bit of water makes the experiment go faster?
6. Choose which colour you want - blue, red, green, yellow, purple?
7. Add about 6-12 drops into the water depending on how much water is in the vase. What do you think? Higher or lower concentration of food colouring will give the best result?
8. Final step, place the daisy in the vase/test tube.
9. Record your name, time and observations on a post-it or label and place on the vase/test tube. Come back throughout the day – observe your daisy! Write the time and observations. Let's see if you can see the flower change colour in a short amount of time. (Note – within an hour, you should begin to see a difference if we have done this correctly 😊).
10. In the meantime, learn all about chlorophyll – that green magical pigment in nature! Place your daisy on the window sills until the following day.
11. Did you try different colors? Do some colours work better than others? Why?

Assessment

1. Where did you think the flower would change colour? Why?
2. Where did the flower actually change colour?
3. Why do you think chlorophyll would be concentrated in the stem of the flower?
4. How did the colour of the flower change in relation to how much water is left in the vase?
5. Did the sun have anything to do with the change? Why or why not?
6. Can any plant change colour like the Daisy did?
7. Which plants do you think can't change colour?
8. What other plants might be able to change colour?

The science behind-the-scenes

Plants take up water through their roots but how does it get up their stem? The answer to this is that they take up water by capillary action. This occurs because water molecules stick together and to the walls of the tube which they are climbing up. They will carry on climbing until gravity gets to be too much. Bigger plants need transpiration to make sure that they get enough water to the high up parts - this involves the continual loss of water from the leaves dragging water up through the plant. The flower in this experiment changed colour because it took up the dye with the water - if you look closely at the petal you should be able to see the veins containing the coloured dye.

Try this...

What would happen if you split a daisy stem vertically and placed each part in a separate vase with a different colour at the same time? Let's try!

Test it on a celery too!: http://www.education.com/activity/article/celery_stick_science_first/

Try this...

If you plant white daisy flower seeds giving it coloured water with food colouring why would the flowers change colour? The reason if you do that is because, flowers have itty bitty tubes in their stems that suck all the nutrients & water out of the ground, helping it grow. So if the water is coloured, then the flower will absorb all that beautiful colour you feed it and the flower becomes that colour.