



Grow

Does temperature and light level affect growth rate?



Cross-curricular links

Engineering: Plants in space

Watch the film: ▶

[bbc.co.uk/
newsround/35343518](http://bbc.co.uk/newsround/35343518)
[bbc.co.uk/
newsround/35764248](http://bbc.co.uk/newsround/35764248)

If humanity is going to really explore the solar system, one of the biggest problems that astronauts need to solve is being able to feed the crew on super-long missions. Astronauts on the International Space Station are studying the best way to grow plants in space. In the table below are some of the questions that astronauts need to answer when they grow plants in space. What solutions can you come up with? Complete the table and then make a poster of your final design.

Problem	My ideas	My design
Where can we get water in space?		
Where can we get enough light?		
Where can we get seeds?		
How will plants know which way is up in space?		
What shall we grow plants in?		
How do we stop everything floating around?		



Science: Growth chambers & greenhouses

Watch the film: ▶

Watch 'Bananas in Iceland': bbc.co.uk/newsround/38184059

In the Grow investigation, children are making growth chambers to grow spring onions in, where you can measure the temperature, water level and growth of the spring onions. Lots of crops are grown in greenhouses. Ask children to think about **why growers might use greenhouses**.

Ask the children to think about how a greenhouse is similar or different to a growth chamber.

Talk about the film - **where do they get the energy to heat the greenhouse from? What other sources of energy could they use to heat the greenhouse? Why is using geothermal heat good for the environment?**

Ask the children to complete the PMI table below - **what things are positives/minuses/interesting about growing bananas in Iceland?**

Positive	Minus	Interesting

Discussion: If you lived on a subarctic island like Iceland, which crops would you grow in your greenhouses? The greenhouses are only large enough to grow eight crops. In groups, discuss which fruit and vegetables you would grow in there and why. Work as a group to come up with your list. Which fruits and vegetables are the most important to grow? Why?



Art & history: Berry tie-dye

Fruit and vegetables have been used to colour fabrics for thousands of years. Historians have discovered prehistoric animal skins and cave paintings dating back to 15,000 B.C.E. that were dyed with plants. They've also discovered examples of early dyed fibres in Egypt dating to around 2000 B.C.E. In the Stone Age, Boudicca and the Iceni tribe used a natural blue plant pigment called woad to colour their faces before going into battle. Further north, a different tribe gained notoriety for painting their bodies with the blue woad dye. The Romans named this Scottish tribe 'Picts', from the Latin 'pictus' meaning 'painted'.



Dye is made from an essential ingredient known as pigment. The pigments in plants are really important. The green pigment, chlorophyll, in the leaves helps to catch the sun's energy and convert it to chemical energy. This is then stored and used as food for the plant. Colours in flowers attract insects and other animals that pollinate and help plants reproduce. Some plants have colourful fruits that attract animals to eat them, spreading the plant's seeds as they do so.

Many colourful plants can be turned into colourful dyes. Have a go at using plant pigments to make tie-dye patterns. Beetroot, spinach, squashes and berries all make good dyes. Please note, it's best to collect your plant material when it is at its most colourful – the colour from plant based dyes is not as intense as the colour of commercial dyes. When using natural dyes, it pays to be patient - the longer you let the fabric soak in the dye, the more colourful your final piece will be.

Health & safety

The BBC deems this activity safe if following some basic precautions. It is your responsibility as a school to carry out your own risk assessment and we recommend you consider the risks and mitigations we have described in this activity pack, as well as any risks which may be relevant to your specific class environment.



**1. You will need:**

- Elastic bands
- A cotton t-shirt or cloth
- 3 cups of edible berries (crushed)
- Saucepans
- Salt
- Water



2. Mix three cups of crushed berries and nine cups of water. Bring this mixture to the boil and simmer for fifteen minutes. Leave to cool. Next, sieve out the fruit, retaining the liquid.



3. To tie dye your fabric, grab sections of the fabric or t-shirt and bind it tightly with rubber bands – the areas of the t-shirt protected by bands or folds will escape being dyed, leaving you with rings or starburst patterns.



4. Place the wet fabric into the dye mixture and leave for 24 hours.



5. Remove the fabric from the dye bath with rubber gloves (you want to dye the cloth, not your hands!). Undo the elastic bands. Rinse the fabric in cold water. Leave the fabric to dry.

Extension ideas: Try varying the amount of time you leave the fabric in the dye. Experiment with making a dye from grass, spinach, or onion skins - which work best?



Question?

Try testing milk, water, lemon juice, cola, orange juice and soapy water to see what happens. Can you place your liquids into groups – acid, neutral or alkali?

Science: Red cabbage indicator

Do you know which liquids in your kitchen are acidic and which are alkali? There are many strong acids and alkalis in plants. For example, citrus fruits like oranges and lemons have citric acid in them. That's what makes lemons taste sour.

Most liquids contain either an acid or an alkali. Acids and alkalis are opposites—acids have a low pH and alkalis have a high pH. Water is neutral and has a pH of 7 on a scale of 0–14. Scientists can tell if a substance is an acid or an alkali by using an indicator strip. An indicator is a chemical that changes colour if it comes in contact with an acid or a base. Red cabbage juice can be used as an indicator because it contains a water-soluble pigment called anthocyanin that changes colour when it is mixed with an acid or a base. The liquid turns red in acids with a pH less than 7 or bluish-green in bases with a pH greater than 7. If there is no colour change, the liquid that you are testing is probably neutral, neither acidic nor basic.



Art: Veggie art

Look at this picture by Giuseppe Arcimboldo. It is named after a season, which one do you think it is?

Arrange some fruit and vegetables into a face shape. Use paints or pastels to create your own picture in the style of Giuseppe Arcimboldo.



Engineering/Design Technology: Design your own plant-watering device



What happens to your house plants when you go away on holiday? When plants don't have enough water, the leaves go floppy or turn brown and fall off. Eventually, the plant dies. So it is important that they are watered regularly. Some plant growers use drip or trickle irrigation systems to ensure that their plants get a steady supply of water. In drip irrigation systems, a perforated plastic pipe is laid on the ground and releases a controlled amount of water near the roots of plants, which minimises water loss due to evaporation.

Your challenge is to:

- 1.** Build a model of a plant-watering device that could be used to water your plants. The water will need to come out slowly so that the plants aren't drowned. Your design will need a reservoir of water and a means of transporting the water to your plants.

- 2.** Develop a poster or leaflet, which will help explain how your device works. You could use: plastic bottles, paper, kitchen roll, plastic tubing, a hot glue gun, sticky tape, cardboard, plastic or paper cups.



Literacy: The great wonky veg debate

Every year households across the UK throw away around ten billion pounds' worth of food. Until recently, supermarkets have refused to sell wonky vegetables saying that customers demand perfect fruit and vegetables. However, in a bid to reduce food waste, supermarkets are now beginning to sell wonky vegetables for reduced prices.

Which do you prefer - wonky or straight vegetables? Does the shape of the vegetables alter the way they taste? Should supermarkets sell more wonky veg? **Think about who is affected by food waste. Why is food waste an issue? Do vegetables taste the same whether they are wonky or straight?**

Watch the film: ▶

[http://www.bbc.co.uk/
newsround/35604270](http://www.bbc.co.uk/newsround/35604270)

[http://www.bbc.co.uk/
newsround/35601824](http://www.bbc.co.uk/newsround/35601824)

Isn't veg just veg, shouldn't it all be the same price - whether it is straight or wonky? Or should wonky veg actually cost more because it is more entertaining?

Debate: Your class is going to debate the motion - ALL VEGETABLES SHOULD COST THE SAME REGARDLESS OF THEIR SHAPE. Discuss whether wonky veg could be a cheap alternative to straight veg or whether all vegetables should cost the same, regardless of their shape.

Choose to argue FOR or AGAINST the motion. Make a list of ideas that you could use to argue your point of view. Hold a debate in your class and then have a vote.