



Food for thought

A British Science Association challenge pack for National Science and Engineering Week

For more information on National Science and Engineering Week or for further challenge packs, please visit www.nsew.org.uk



National Science and Engineering Week is funded by the Department for Business Innovation and Skills

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Yum yum! This challenge pack is full of activities on the theme of food science. The “Food for thought” activities have all been designed for use in discrete 45-60 minute class or science club sessions. Successful completion of each of these activities can count towards a CREST ★ Investigator award (see the end of the pack for details!). There are 5 Star and SuperStar activities in the pack, one for each day of NSEW!

In Star activities (usually for 5-7 year olds) children discuss, solve problems and share experiences. In SuperStar activities (usually for 7 – 11 year olds) children work independently, discuss ideas and how to test them, solve simple problems and decide how to share results. Extra suggestions are also given for each activity for older or more advanced children.



The Story

It's National Science and Engineering Week at Startown Primary School and Mrs Teachem, the head teacher, is holding a special assembly. On the table in front of her are a cake, a bowl of apples and a bottle of fizzy lemonade. “Are we going on a picnic?” asks one of the children. “No”, says Mrs Teachem. “These are some of the items that you are going to need for your NSEW challenges.”

Apples? Cake? Lemonade? Can these really be science? Oh yes, and if you want to know more then you will have to read on...



Tasty Tricks

Your challenge

Which apples are nicer, red or green apples? Do you think you can tell them apart simply by their taste? Work together to see whether there is a difference between different types of apples and how sight, smell and taste might affect your results.

Talk about

- ★ Do you ever help to buy apples?
- ★ What different sorts of apple are there?
- ★ What sort of apples do you choose?

Here's one way to find out

- ★ Take some red and green apples.
- ★ Ask a grown-up to slice the apples into small pieces.
- ★ Close your eyes and see if you can tell which are red and which are green just by tasting them.
- ★ How will you make sure everything is fair?

Share your ideas

- ★ How do the apples taste different?
- ★ Which is your favourite and why?

Here are some extra things that you can do

- ★ Pinch your nose (so that you can't smell the apples) and try the apple tasting again. Can you still pick out your favourite apple?
- ★ Try changing the colour of the apple slices using food colouring – if the slices are blue or red (!) does this affect your choice of favourite?
- ★ Have an apple tasting at home to see if grown ups and children like the same sorts of apple.



Tasty Tricks

ORGANISER'S NOTES

What do I do?

1. Read the challenge together.
2. Discuss the 'talk about' questions – children might like to discuss these with a buddy first.
3. Decide together how you are going to taste test the apples.
4. When finished, talk about which was everyone's favourite apple and why? and whether colour of the skin is really important to this choice or not?
5. There are follow up activities for children who are finished or who want to investigate more at home.

Background information

- ★ Colour can have a big influence on how we appreciate food.
- ★ Supermarkets often have special lights over the fruit and vegetable counters to make the colour of the merchandise look more appealing.
- ★ Smell is also important to our enjoyment of food. If you have a blocked up nose this affects your sense of taste.
- ★ Unripe apples are sourer than ripe apples because of the malic acid in them. All apples have malic acid but the amount declines as the apple ripens and the apple becomes sweeter. Depending on the soil and climate in which the apples are grown, some varieties are more tart than others.

Things to look out for

- ★ Encourage children to think about how they can make sure that nobody cheats and opens their eyes to look at the colour.
- ★ Should the apple be tasted with or without the peel?!
- ★ It is difficult to measure 'taste', everyone has their own opinion.
- ★ Which apple is the best? There are different ways of measuring this e.g.
 - best colour
 - best crunch
 - sweetest tasting
 - nicest smell...or something else?
- ★ Is the same apple 'best' all the time?

Resources

- ★ A selection of red and green apples of different varieties (at least 2 types of each)
- ★ Plastic trays/cups to put slices of apple on
- ★ Knife and chopping board for adult to slice up apples

How can they share their ideas?

They can produce a bar chart using ☺ to each vote for their favourite apple.

Safety

- ★ Adults should slice up the apples.
- ★ Remind children to wash their hands before eating food.



Going on a Plant Munch

Your challenge

When you eat fruit and vegetables, do you eat all of the plant or part of the plant? Which parts can we eat and which bits are best left alone? Take this veggie challenge with your friends to work out the edible parts of plants and decide what groups to sort plants into.

Talk about

- ★ What parts of a plant are there?
- ★ Do you eat plants? all the plant? or part of the plant?

Here's one way to find out

- ★ Gather different parts of plants that you can eat.
- ★ Decide whether you have the whole plant or part of the plant.
- ★ If you have part of the plant, can you work out which part it is?

Share your ideas

- ★ Can you sort the plant foods into different groups according to what part of them you eat?
- ★ Are plants good for a healthy diet? Why?

Here are some extra things that you can do

- ★ Collect together photos of other plant foods and decide which plant and which part you eat.
- ★ Identify the more common food plants which can be grown in this country. Where do other plants grow?
- ★ Can you sort the plant foods in any other way? such as by size? colour? cost?
- ★ Try a blind tasting.



Going on a Plant Munch

ORGANISER'S NOTES

What do I do?

1. Read the challenge.
2. Discuss the 'talk about' questions – children might like to discuss these with a buddy first.
3. Decide how you will identify which part of the plant you are eating.
4. Get the children to sort the plants into groups. Let them decide which group to sort them into.
5. Talk about the groupings – any surprises? any patterns?
6. There are follow up activities for children who are finished or who want to investigate more at home.

Background information

- ★ There are no parts of plants that we don't eat across the plant kingdom – but this doesn't mean to say that we can eat *every* part of *every* plant (e.g. rhubarb – we eat the stems but the leaves have such a high level of oxalic acid in them that they are deemed poisonous to humans and animals).
- ★ We tend to refer to food plants as either 'fruit' or 'vegetable' broadly depending on their sweetness. Although plants referred to as 'fruit' are generally true botanical fruits, there are exceptions for example rhubarb and pineapple are not fruits but stems. 'Vegetables' are a real mix of plant parts from root (turnip) to leaf (cabbage) to fruit (!) (tomato).
- ★ Food plants can be eaten raw or cooked. Eating raw plants usually gives us maximum benefit from the vitamins they contain but cooking is necessary for some plants such as potatoes to render them digestible.

Things to look out for

- ★ Parts of a plant that you might decide to distinguish between are
 - Root
 - Stem/stalk
 - Leaf
 - Bud
 - Flower
 - Fruit
 - Seeds
- ★ If the children are uncertain as to which part of the plant it is that they are looking at, encourage them to think about ways they could research the answer e.g. books, internet, ask the school cook, talk to a gardener.

Resources

- ★ A suitable plant (e.g. pot plant, garden weed) to use as an example for plant-part identification.
- ★ An assortment of different food plants (or photos of plants).
- ★ Chopping knife and board (if you want the children to taste the produce).

How can they share their ideas?

- ★ Children could share experiences of unusual plants that they have eaten
- ★ Children could draw or paint unusual edible plants

Safety

- ★ Warn children that it is not necessarily safe to eat every part of every plant (e.g. rhubarb) and that they should always check with an adult first. Remind them that particular care needs to be taken with eating wild berries & fungi.
- ★ Wash produce before tasting.
- ★ Wash hands before handling and eating food.



Fat-tastic Foods

Your challenge

Can you tell the difference between a food that is high in fat and one that is fat free? Discover how much fat different foods have in them by working in small groups and using your investigation skills.

Talk about

- ★ What is fat?
- ★ What foods (solid and liquid foods!) do you think contain lots of fat?

Here's one way to find out

- ★ Draw 6 - 9 circles on a piece of paper.
- ★ Label each circle with one of the foods you will be testing.
- ★ Label one of the circles 'water'.
- ★ Rub a bit of the food (or drip if it's liquid) in its own circle and drip some water onto the water circle.
- ★ When the water circle is quite dry, hold the paper up to the light. A translucent spot (translucent – some light passes through) is a positive test for fat. What do you see?

Share your ideas

- ★ Which foods contained the most fat? Was it easy to tell?
- ★ Are fatty foods good for you?

Here are some extra things that you can do

- ★ Compare the fat content of different types of milk (whole milk; semi-skimmed, cream) and/or different sorts of spreads.
- ★ Try fat spots on different sorts of paper – which paper is best for fat-testing?
- ★ Carry out some research into the different sorts of fat in food.



Fat-tastic Foods

ORGANISER'S NOTES

What do I do?

1. Read the challenge together.
2. Discuss the 'talk about' questions – children might like to discuss these with a buddy first.
3. Select the foods you are going to test.
4. As a group, think about how you will decide which foods have the most fat.
5. Afterwards, talk about the results. Any surprises?
6. There are follow up activities for children who are finished or who want to investigate more at home.

Background information

- ★ The test for fat is simply to squash a sample of food onto a piece of paper and leave it to dry. Both water and fat produce a spot by filling in the spaces between the fibres and the paper. Spots made by water in the food evaporate in the air (and dry) but the fat globules remain. A positive test is a translucent stain around the food sample when you hold the paper up to the light.
Science Vocabulary: transparent = allows light to pass through e.g. glass; translucent = some light can pass through; opaque = no light passes through.
- ★ Fat has an important place as part of a balanced diet. Fats provide a source of energy and contain fat-soluble vitamins. Stored beneath the skin, fat also helps to insulate us from the cold. However too much fat, (or too much carbohydrate and protein which the body may convert to fat), can lead to becoming over-weight. It's important to balance the amount of energy containing foods you eat with the amount of energy that you use.

Things to look out for

- ★ Avoid paper with a very shiny finish for fat testing. Brown paper or coloured 'sugar paper' both work particularly well.
- ★ The assessment of the amount of fat in food is difficult to take much further beyond 'a lot', 'some' or 'none'. You may like to challenge the children to think about whether they have made their tests as fair as they could, for example whether the results might have been affected by altering the amount of food they used or the number of rubs.
- ★ Avoid cross-contamination (oil is particularly good at sticking to fingers). If oil is used as one of the test foods, it may be best to test it last.

Resources

- ★ A selection of foods to test e.g. peanut butter, oil, margarine, milk, cake, bread, crisps, lemon etc.
- ★ Paper and pencil
- ★ Access to water
- ★ Kitchen towel/cotton buds (useful for rubbing on foodstuffs such as peanut butter)

How can they share their ideas?

- ★ Children can share their results using a chart with pictures of foods in the order of fat content.

Safety

- ★ Remind children to wash their hands before and after handling food.



Crazy Custard

Your challenge

Whether you like custard or not, it's a crazy substance that can't quite make up its mind... is it a solid or is it a liquid? Run this experiment with your group to find out what is going on.

Talk about

- ★ What are the differences between a solid and a liquid?
- ★ Have you ever helped to make custard?

Here's one way to find out

- ★ Take 4 measures of custard powder (or cornflour)
- ★ Add one measure of water, stir. Solid? Or liquid?
- ★ Add another measure of water, stir. Solid? Or liquid?
- ★ Add a further measure of water, stir. Solid? Or liquid?

Share your ideas

- ★ Is custard solid? Or liquid? Or both?

Here are some extra things that you can do

- ★ Quicksand, a mixture of sand and water, can behave in the same way as Crazy Custard. Use what you have discovered about Crazy Custard to devise an escape plan from quicksand!
- ★ Try creating your own quicksand using a sand/water mix instead of a custard/water mix. Does it work?!
- ★ Experiment with some silly putty – does it have anything in common with Crazy Custard?



Crazy Custard

ORGANISER'S NOTES

What do I do?

1. Read the challenge.
2. Discuss the 'talk about' questions – children might like to discuss these with a buddy first. Useful props to have might be:
 - o A bowl of water (liquid)
 - o A lump of wood (solid)
 - o A bowl of lentils (solid – but because they are small, lots of them together take the shape of the bowl)
 - o Custard powder (solid like the lentils but particles are even smaller.)
3. Decide what 'measure' you are going to use and how you are going to mix the custard.
4. When you have finished, discuss your answer to the challenge.
5. There are follow up activities for children who have finished or who want to investigate more at home.

Background information

- ★ One measure of water with four measures of powder behaves like a solid.
- Two measures of water with four measures of powder produces a liquid/solid mix. The custard powder particles (solid) don't actually dissolve in the water (liquid) but become suspended in the water. When you move the mixture slowly, the custard particles move around freely in the water – the mixture acts as a liquid. When you move the mixture faster (or hold it tightly in your hand) the custard powder particles rub against each other and friction makes them stick together – the mixture acts like a solid. A solid/liquid mixture that behaves in this way is called a DILATANT.
- Three or more measures of water with four measures of powder behave like a liquid.
- ★ Another dilatant mixture is quicksand – a mixture of sand and water. The best way to escape from quicksand is not to thrash about – this will cause the sand particles to stick together and it will be harder to get out. If you move slowly, or even lie back and float, the quicksand behaves like a liquid and it will be easier to escape.
- ★ Quicksand can form where flowing underground water or shaking ground (as in earthquakes) and groundwater coming together. The next time you are at the beach notice the difference in the sand as you stand on different parts of the beach that have varying levels of moisture. Beach sand can become quicksand if an excessive amount of water flows through the sand.
- ★ Silly putty is sometimes described as a dilatant fluid – it will flow if handled slowly, but will 'snap' if handled roughly.

Things to look out for

- ★ Use custard powder NOT instant custard mix.
- ★ A suitable 'measure' might be a coffee scoop or a desert spoon.
- ★ Encourage the children to think about how they can distinguish between a solid and a liquid – does it flow? What does it feel like? Can you roll it into a ball? Can you cut it with scissors?!

Resources

- ★ Custard powder (or cornflour) and water
- ★ A suitable 'measure'
- ★ A bowl and something to stir with

How can they share their ideas?

For each different powder/water mix the children can vote for 'solid' or 'liquid' or 'both'.

Safety

- ★ Custard powder contains colouring. Cornflour can be substituted if anyone is subject to food allergies.
- ★ Children should not eat the custard suspension.



Dancing Food

Your challenge

Have you ever watched the bubbles in a glass of fizzy drink? Where do they go? If you drop a raisin into the same glass something interesting happens again and again and again... Investigate to see if you can find out what's going on. Maybe there are other food items that behave in the same way.

Talk about

- ★ What gives the 'fizz' to fizzy drinks?
- ★ When do drinks 'fizz'? For how long?

Here's one way to find out

- ★ Take a glass of fizzy lemonade or water and drop in a raisin, wait and see what happens.
- ★ Can you find any other small food items that will behave in the same way? (You could try grapes, very fine spaghetti or... maybe you can find something else?)
- ★ Have a competition to find the best 'dancer' – you could compete with different raisins or different items of food.
- ★ How will you make sure the competition is fair?

Share your ideas

- ★ Why do you think the raisins behave in this way?
- ★ What sorts of food make the best dancers and why?

Here are some extra things that you can do

- ★ How many visits to the surface does one raisin make in 5 minutes. Time for another 5 minutes, and then another 5 minutes. Is the number of visits always the same? If not, can you explain why not?
- ★ Does the type of fizzy drink used affect how the food items dance? You could try fizzy water, fizzy lemonade or something else.
- ★ Have a look around the kitchen at home and see how many other different dancing foods you can find.



Dancing Food

ORGANISER'S NOTES

What do I do?

1. Read the challenge together.
2. Discuss the 'talk about' questions – children might like to discuss these with a buddy first.
3. Experiment with a raisin in a glass of fizzy drink. Ask the children if they can explain what is happening.
4. Try out the different food items together to find the best dancer(s).
5. Organise a food dancing competition – you will need to agree the rules first!
6. When the competition is over, discuss why some foods were better than others.
7. There are follow up activities for children who have finished or who want to investigate more at home.

Background information

- ★ Fizzy drinks are produced by injecting carbon dioxide into the drink at pressure. When the pressure is released (bottle opened!) the carbon dioxide comes out of solution forming numerous bubbles and releasing the carbon dioxide back into the atmosphere. After a few hours, most of the carbon dioxide has been released and the drink is said to be 'flat'.
- ★ When you add an item such as a raisin to a glass of fizzy liquid, at first the raisin sinks because it is denser or heavier than the drink. As bubbles of carbon dioxide attach themselves to the surface of the raisin, its mean density becomes less and the raisin rises to the surface. At the surface, the bubbles burst and the raisin sinks to start the cycle all over again.
- ★ The best 'dancers' are those which have a surface that will collect bubbles and whose density is slightly greater than water.
- ★ As the fizzy drink begins to go flat the rate of rising and sinking will slow. Eventually there is insufficient carbon dioxide coming out of solution to carry the food to the surface.

Things to look out for

- ★ Some brands of fizzy drink contain more 'fizz' than others - it may be worthwhile investing in a more expensive brand to start with!
- ★ Encourage children to set the rules of the race to make it as fair as possible (e.g. starting together, same fresh fizzy drink, same sort of tumbler/glass etc.)
- ★ The winner could be decided by counting the number of visits to the surface in a set period of time.

Resources

- ★ Fizzy drink(s)
- ★ Plastic tumblers/glasses
- ★ Selection of food items
- ★ Stopwatch

How can they share their ideas?

Create a winners' podium to display the best 'dancer'.

Safety

- ★ Mop up any spills to prevent a slip hazard.
- ★ Remind children not to eat and drink the foods they have been testing.

Something Fruity

Your challenge

Ever made a fruit salad and found out half way through that the apple has gone all brown? Yuck. Investigate why this happens and see if you can come up with a way to prevent it.

Talk about

- ★ When do apples turn brown?
- ★ Have you ever seen anyone do anything to try and stop the browning?
- ★ If an apple turns brown, does it actually taste any different?

Here are some ideas to get you started

- ★ What different ways of preventing apple browning will you try? (Stuck for ideas? – then you will need to do a bit of research – books, internet or quiz a few cooks!)
- ★ How will you measure and record your results?
- ★ How will you make sure that your tests are fair?

Now you can start investigating apple browning

Get everything ready and then ask an adult to help you cut up some apples.

Sharing your ideas

Talk about what you have found. What would you recommend doing to prevent apple browning? Create a photo display of the apple browning process.

Here are some extra challenges

- ★ Is temperature important? Do apples turn brown any faster/slower in the fridge?
- ★ If water works – does it make a difference if the water is hot or cold? Or whether the water contains sugar?
- ★ If fruit juice works – are different fruit juices equally effective? Experiment with oranges, lemons, limes or something else.
- ★ Do the 'anti-browning' measures affect the apple taste in any way? How could you test this?
- ★ Can you find out any information about the chemical changes taking place when apples turn brown?
- ★ Could you prevent potatoes or bananas going brown in the same way?

Something Fruity

ORGANISER'S NOTES

What do I do?

1. Read the children's card to familiarise yourself with the activity.
2. Check the resources.
3. Set the scene by discussing the problem with the children.
4. Give the children time to discuss with a buddy their ideas on ways of preventing apples turning brown.
5. Gather everyone's ideas and discuss how you are going to test these and how you will measure and record the results.
6. Now let the children try out their ideas and see what happens.
7. When they have finished talk about what they found and which method they would recommend and why.
8. There are extra challenges on the children's card. These can be used if there is any spare time or if the children want to try out more ideas at home.

Background information

- ★ When you cut an apple you damage its cells, releasing an enzyme called polyphenol oxidase. The enzyme speeds up the process by which compounds in the apple (phenols) combine with oxygen from the air – to produce the brownish pigment that darkens the fruit.
- ★ The enzyme can be slowed or prevented by: temperature (slowed by cold, inactivated by heat -cooking), reducing the pH on the surface of the fruit (by adding lemon juice or another acid), reducing the amount of oxygen (putting the fruit under water or closely wrapping with clingfilm).
- ★ Untreated apple at room temperature turns brown quite quickly, slices treated with lemon juice in the fridge stay fresh for a much longer time.

Things to look out for

- ★ Don't slice up the apples until everything else is ready.
- ★ Decide how you will assess the amount of browning.

Resources

- ★ Slices of apple
- ★ Dishes/cups to put the slices of apple into for testing
- ★ Access to water
- ★ Lemon juice/orange juice/sugar/lemonade/bicarbonate of soda
- ★ Cling film
- ★ Stop watches
- ★ Access to fridge

Safety

- ★ Slicing of apples should be supervised or undertaken by adults.
- ★ Remind children to wash their hands before and after handling food.

Ready, Bread-y, Go!

Your challenge

Why are some types of bread flat and firm and others light and spongy? What makes bread rise? Get stuck in and investigate what it takes to make the perfect loaf of bread.

Talk about

- ★ How many different kinds of bread are there?
- ★ Do you know what bread is made from and how it is made?
- ★ Which ingredient makes bread rise?

Here are some ideas to get you started

- ★ Collect together the basic bread ingredients of yeast, sugar and flour together with some half-filled cups of warm water.
- ★ Which of the basic ingredients do you think is most important to put the 'rise' into bread? How could you test this? What do you think you will see?

Now you can start investigating

Label your cups carefully. Watch closely for 30 minutes and note at intervals what is happening in each of the cups.

Sharing your ideas

Talk about what you have found.

- ★ Compare your bread with other groups. Did all the bread 'rise' at the same rate?
- ★ Create a winners' podium of the 'perfect' bread.

Here are some extra challenges

- ★ If you change the temperature of the water does it work better if the water is hotter? or colder?
- ★ Is there anything else you could change?
- ★ Look up some different bread recipes. What else is sometimes added in addition to the basic ingredients? What effect do you think the extra ingredients have?
- ★ Try making some bread with an adult at home.

Ready, Bread-y, Go!

ORGANISER'S NOTES



What do I do?

1. Read the children's card to familiarise yourself with the activity.
2. Check the resources.
3. Set the scene by discussing breads and bread-making with the children.
4. Give the children time to discuss with a buddy their ideas on what makes bread rise.
5. Gather everyone's ideas and discuss how you are going to test these and how you will record the results.
6. Now let the children try out their ideas and see what happens.
7. When they have finished, talk about what they found. The children can have a display of their 'perfect' bread.
8. There are extra challenges on the children's card. These can be used if there is any spare time or if the children want to try out more ideas at home.

Background information

- ★ Yeast is the ingredient commonly used to make bread rise. It is a single-celled fungus, usually bought in supermarkets in a dried form. Dried yeast remains dormant until brought into contact with warm water.
- ★ Yeast feeds on sugar to release carbon dioxide gas (which makes the bread rise) and alcohol (which evaporates in baking).
- ★ Flour is a starch and starch contains glucose, a form of sugar. To access the sugar in flour, the yeast has first to attack the starch with enzymes. Fermentation occurs with just yeast and flour (no sugar) but it can be very slow.
- ★ Yeast grows best at a temperature of between 27 and 32 °C. At temperatures lower than 10 °C yeast is inactive, above 54 °C yeast dies.

Things to look out for

- ★ Use small quantities of the ingredients. One way to start might be:

Cup 1	1 tsp flour + 1 tsp sugar (no yeast)
Cup 2	Half a teaspoon of yeast (only yeast)
Cup 3	Half a teaspoon of yeast + 1 tsp sugar
Cup 4	Half a teaspoon of yeast + 1 tsp flour
Cup 5	half a teaspoon of yeast + 1 tsp flour + 1 tsp sugar

Any cup containing yeast and sugar should start producing bubbles within 5- 10 minutes.

- ★ Water used should be warm but not hot.
- ★ Mix ingredients well.
- ★ Too much sugar will slow the production of carbon dioxide or even stop activity completely – children might like to investigate what 'too much' is!

Resources

- ★ Plastic cups/glasses
- ★ Access to water
- ★ Dried yeast, sugar, flour (plain flour or strong bread flour – not self-raising)
- ★ Teaspoon (to measure and stir)
- ★ Timer

Safety

- ★ Danger of scalding from water which is too hot

Spitacular Science

Your challenge

How do we break down our food? What makes up the food we eat? Work together to investigate how the body breaks down food – starting with the spit in our mouths!

Talk about

- ★ What is starch?
- ★ Do you know of any foods that contain starch?
- ★ Why do we have saliva? What is it?

Here are some ideas to get you started

Wash some uncooked rice grains (say a coffee scoop or tablespoon-ful) in warm water in a cup – stir well for a minute or so. What happens to the colour and clarity of the water? Pour off and retain the water, discard the rice grains.

Add a drop of iodine solution to a sample of your rice-water. What happens? What does this tell you?

- ★ How could you test whether saliva 'attacks' starch?
- ★ What factors do you need to take into consideration? e.g. length of time? temperature? amount of liquid? something else?
- ★ How can ensure that your tests are fair?
- ★ Are there any other foods that contain starch which you can test?

Now you can start investigating saliva attack!

Label your cups carefully and keep a record of what happens.

Sharing your ideas

Talk about what you have found.

- ★ Create a poster to tell your friends how the body breaks down our food.

Here are some extra challenges

- ★ Bread is another starch-rich food. If you chew bread thoroughly, what do you think happens to the starch inside your mouth? Could you devise an experiment to show this? (you won't be able to swallow the chewed bread if you want to test it with iodine solution!)
- ★ Does the concentration of enzymes in your saliva vary according to how hungry you are? or how mouth-watering the food looks? How could you test this?
- ★ Take a selection of different foods and test them for starch. Which ones have the highest starch content?
- ★ Carry out some research into the importance of starch as part of a balanced diet.

What do I do?

1. Read the children's card to familiarise yourself with the activity.
2. Check the resources.
3. Set the scene by discussing the problem with the children.
4. Give the children time to discuss with a buddy their ideas about starch, enzymes and digestive processes.
5. Get groups of children (2 to 3 is best) to make some 'rice-water' and test for starch, then discuss how you are going to tackle the challenge.
6. Now let the children try out their ideas and see what happens.
7. When they have finished talk about what they found.
8. There are extra challenges on the children's card. These can be used if there is any spare time or if the children want to try out more ideas at home.

Background information

- ★ Starch is a molecule that plants make in order to store sugar. If we eat food containing starch, as part of the digestive process an enzyme (amylase) in our saliva breaks down the starch into smaller sugar molecules (glucose, maltose and dextrin).
- ★ Iodine solution can be used to test for presence of starch - starch reacts with iodine to form a blue/black colour. Sugar does not react with the iodine – no blue/black colour is formed.
- ★ Starch doesn't taste sweet but glucose and maltose do. You can test this by chewing a piece of bread (another starch-rich food) in your mouth, the longer you chew, the sweeter the bread begins to taste.
- ★ You can buy iodine very cheaply as 'iodine tincture' in chemists. It is used as an antiseptic for treating minor wounds. You only need to use a small amount (one or two drops is quite sufficient). If you haven't got a pipette or 'dropper', use a straw (thin straws are best). Cut a length of straw, stand straw in iodine bottle, then place finger over the top of straw and remove from bottle (trapping iodine inside the straw), release finger and trapped iodine solution will run out. With a bit of practice it's possible to get quite good at using the straw to deliver just one or two drops (practice with some water!)

Things to look out for

- ★ One simple way to produce 'saliva solution' is to roll a mouthful of water round your mouth for a while.
- ★ Fair testing – same amount and concentration of starch solution, same amount and concentration of saliva, same amount of agitation, control with no saliva, control with no starch.
- ★ Be patient! The blue/black colour in a cup of starch solution and saliva should lighten and then completely disappear over 5 – 15 minutes (provided that the starch solution isn't too concentrated for the amount of saliva added).

Resources

- ★ Tincture of iodine
- ★ Cups/glasses (stack of plastic cups very useful)
- ★ Stirrer e.g. teaspoon
- ★ Dropper/straw
- ★ Rice e.g. uncooked long grain rice
- ★ Stopwatch

Safety

- ★ Iodine tincture will stain (skin and other surfaces) and it will sting on cuts or broken skin (it is sold for use as an antiseptic). Use in small quantities (add by the drop) and do not ingest.
- ★ Hygiene – ensure each child producing 'saliva solution' uses their own cup.

The Penny Drops

Your challenge

Acids are often natural cleaners. There are a number of acids that we consume directly or use in cooking. Do you think you could identify some of these and use them to clean up a pot of pennies? Design an experiment to see whether it's possible to polish a penny with your provisions!

Talk about

Collect some pennies together and have a good look at them.

- ★ What do you notice about their colour?
- ★ Do the pennies all look the same?
- ★ Have you got any ideas how to clean them?
- ★ What is an 'acid'? Can you think of some examples that you can find in the kitchen?

Here are some ideas to get you started

- ★ Collect together some edible acids from the kitchen. Can you use these to clean the pennies? What will you do?
- ★ How will you tell if the pennies are any cleaner?
- ★ How will you make sure that your tests are fair?

Now you can start investigating cleaning pennies

Keep a careful record of what you put in each cup. Try adding a 'pinch of salt' to the cleaning solution – does it improve or speed up the cleaning process?

Sharing your ideas

- ★ Which acids worked best?
- ★ What do you think might be the effect of acids in food and drink on teeth? Is there anything that you could do reduce this?
- ★ Create a poster to tell people about the effects of acid on teeth.
- ★ Create a display of the 'cleaned' pennies with labels of what ingredients were used to clean it.

Here are some extra challenges

- ★ Try different brands of vinegar or different types of fizzy drink – are they equally effective?
- ★ Put a nail into the used cleaning liquid (it's best if it's a solution that has been used to clean several pennies), leave for 15 minutes or so – does anything happen to the colour of the nail? Can you carry out some research to find out what's happening?

For something entirely different...

- ★ Are the pennies attracted to a magnet? All of them? Or just some of them? Why do you think this is?

The Penny Drops

ORGANISER'S NOTES



What do I do?

1. Read the children's card to familiarise yourself with the activity.
2. Check the resources.
3. Set the scene by discussing the problem with the children.
4. Give the children time to discuss with a buddy their ideas on ways of cleaning pennies and what to use.
5. Pool everyone's ideas and discuss how you are going to test these and how you will measure and record the results.
6. Now let the children work in groups, try out their ideas and see what happens.
7. Let the children decide on how to share their results.
8. When they have finished talk about what they found.
9. There are extra challenges on the children's card. These can be used if there is any spare time or if the children want to try out more ideas at home.

Background information

- ★ Pennies are largely made from the metal copper and they dull over time because the copper reacts slowly with air to form copper oxide. Pure copper is bright and shiny, copper oxide is black.
- ★ When you place pennies in an acid solution, the copper oxide dissolves leaving behind shiny, clean pennies. Suitable acids to use may include:
 - Acetic acid (vinegar).
 - Ascorbic acid (otherwise known as vitamin C) found in citrus fruit such as oranges and lemons, easily accessible as fruit juice.
 - Carbonic acid –any fizzy drink contains a small amount carbonic acid as a proportion of the 'fizz' (carbon dioxide) dissolves in the drink.
- ★ The stronger the acid (i.e. the lower its pH) the more corrosive it is and the faster the cleaning process. If indicator paper or red cabbage water is available, then these can be used to test the relative strengths of different acids.
- ★ A teaspoon of salt (sodium chloride) to each quarter cup of liquid vastly speeds up the cleaning process. The reason why is complicated (involving conductivity of solution and concentration of dissolved copper ions, ask a chemist if you want the full story!) but do try because it certainly works.
- ★ The metal alloy used to make pennies hasn't always been the same. Only some pennies are attracted to magnets according to their age. With sufficient pennies, it should be possible to discover in which year the alloy was changed.

Things to look out for

- ★ The easiest way to clean the pennies is to soak them in a small amount of liquid (say 50-100 mls). Without salt, pennies will need to be left for 10-15 minutes. With salt, the cleaning process is almost instant.
- ★ How can the amount of cleaning best be assessed? Keep some pennies un-cleaned for comparison.
- ★ Fair testing – same amount of cleaning liquid; same amount of time/agitation; same amount of salt (if used); include water as one of the test liquids; pennies used of a similar dullness etc.
- ★ Rinse cleaned pennies in fresh water after testing.

Resources

- ★ Pennies
- ★ Cups/containers to clean the pennies in, e.g. a stack of plastic cups
- ★ Test food acids e.g. vinegar, fizzy drink(s), fresh lemon and/or orange juice
- ★ Adsorbent paper (e.g. kitchen towel) to dry pennies
- ★ Salt (and teaspoon to measure with)
- ★ Access to water

Safety

- ★ Check whether any children have a citric acid allergy.
- ★ Children should wash hands after handling the 'food acids'.
- ★ Take special care with vinegar which has a very pungent smell. Keep well away from eyes Salt (and

Fizzy Fun

Your challenge

Who is a fan of fizzy drinks and sizzling sherbet? What is it about these things that makes them fizz and bubble? Have a go at making your own fizz and find out more about the science behind it.

Talk about

- ★ What gives the 'fizz' to fizzy drinks? When exactly do they 'fizz'?
- ★ Sherbet powder is made from sugar, citric acid and bicarbonate of soda. When does sherbet powder fizz? Is the 'fizz' the same as in fizzy drinks?

Here are some ideas to get you started

- ★ Taste the three sherbet ingredients one at a time. What do they taste like? Do any of them taste fizzy?
- ★ Try mixing the ingredients in pairs (sugar + citric acid; sugar + bicarbonate; citric acid + bicarbonate), taste again, do any of them fizz now?
- ★ Can you work out what function each of the sherbet ingredients has?

Now you can start designing your own fizz powder

Now design your own fizz powder by adding the 3 ingredients together in different proportions. Discuss amongst yourselves how you are going to do this and how you will test the powders. Keep note of all the recipes.

Sharing your ideas

- ★ Run a taste test and vote for your favourite powder.
- ★ You could also produce posters or packaging advertising your prize-winning powder.

Here are some extra challenges

- ★ Could you devise a way to actually measure which powder is the fizziest?
- ★ Could you add another flavour to the sherbet? Any added flavouring would need to be **dry** otherwise the sherbet would start to fizz straight away.
- ★ Design a fizzy cocktail drink by adding fizz powder to?
- ★ Take a glass of fruit juice and add a teaspoon of bicarbonate of soda. Watch what happens and see if you can explain this.

Fizzy Fun

ORGANISER'S NOTES



What do I do?

1. Read the children's card to familiarise yourself with the activity.
2. Check the resources.
3. Set the scene by discussing the problem with the children.
4. Give the children time to discuss with a buddy their ideas on what causes 'fizz'.
5. Get the children to taste the sherbet ingredients one a time and again with ingredients mixed together in pairs.
6. Now let the children work in pairs or groups to design their own sherbet powders.
7. When they have finished try a sherbet tasting and vote for the best powder!
8. There are extra challenges on the children's card. These can be used if there is any spare time or if the children want to try out more ideas at home.

Background information

- ★ The gas in fizzy drinks is carbon dioxide.
- ★ The 'fizz' in sherbet powder is also carbon dioxide - produced when the citric acid crystals dissolve in the saliva on your tongue and react with the bicarbonate of soda (citric acid + bicarbonate of soda produce sodium citrate + water + carbon dioxide). The sugar is in the sherbet to make it sweet. The citric acid to make it tart and to provide the fizz together with the bicarbonate. Changing the proportion of acid to bicarbonate changes the amount of fizz.
- ★ To add flavour to the sherbet - the majority of flavourings available are in liquid form, if these were added then the sherbet would stop being a powder and start to fizz straight away. You need to add dry flavourings e.g. cinnamon or other spices, crushed parma violets. Alternatively you could add flavoured sugar – made by storing sugar together with ingredients such as mint leaves or vanilla pods.
- ★ Add the sherbet powder to a still drink of your choice to make fizzy drink.
- ★ Fresh fruit juices such as orange or grapefruit juice contain citric acid. They will fizz quite impressively by the simple addition of just a teaspoon of bicarbonate of soda.

Things to look out for

- ★ Make sure that all the equipment is dry.
- ★ Mix ingredients together well and measure out carefully. Keep a record of exactly what is in each mix. One way to start might be:
 1. 2 teaspoons of icing sugar + half a teaspoon of citric acid + half a teaspoon of bicarbonate (amount of fizz? taste?)
 2. 2 tps of icing sugar + half a tsp of citric acid + 1 tsp of bicarbonate (amount of fizz? taste?)
 3. 2 tps icing sugar + 1 tsp citric acid + half tsp bicarbonate etc.
- ★ Testing could be carried out by sucking powder through a straw or by tasting a small amount of powder on individual spoons.

Resources

- ★ Citric acid (food grade), cream of tartar or tartaric acid – obtainable from chemists or supermarkets.
- ★ Bicarbonate of soda (supermarket)
- ★ Icing sugar
- ★ Containers (plastic cups or similar)
- ★ Tea spoons to measure and mix
- ★ Cups/fruit juice/water for fizzy drink making
- ★ Individual straws to taste (or individual spoon or similar)

Safety

- ★ Remind children not to share straws.
- ★ Check whether any children have a food allergy (citric acid, sugar).
- ★ Children should wash hands after handling the food.

LONGER TERM PROJECTS RELATED TO FOOD...

GREEN FINGERS

Grow yourself a crop of cress or cultivate a carrot top. What do you need in the way of light, temperature, moisture?

HOW DOES YOUR MOULDY GARDEN GROW?

Mould is a fungus and can easily be grown on bread. What sorts of conditions work best? (type of bread, light level, amount of moisture, temperature etc.)

TAKE CARE! Bread moulds can cause infections so make sure that you handle with gloves and keep in sealed containers e.g. plastic bags.

FOOD FAR, FAR AWAY

What are food miles? How far has your food travelled? Why do food miles matter? What can I do?

CRYSTAL GARDEN

Everyday foods such as sugar can be used to grow crystals. Have a crystal-growing competition.

DYING TO DYE

Who can come up with the most colourful T-shirt dyed with natural food stuffs using onion skins, walnut shells, beetroot etc.

EDUCATIONAL LINKS

The activities and challenges within this pack can be used to complement, or contribute to, the Science and Art & Design sections of the National Curricula in England, Wales and Northern Ireland, and the Scottish 5-14 Guidelines in Environmental Studies and Expressive Arts. We recommend that you consult the National Curriculum on the website (www.nc.uk.net/), and the 5-14 Guidelines (www.ltscotland.org.uk/5to14).

DO YOU WANT MORE?

If you enjoyed these activities and would like to do more then why not register for CREST ★ Investigators and receive a pack of further activities and investigations?

CREST ★ Investigators is a brand new, UK-wide award scheme that enables children to solve scientific problems through practical investigation. The activities focus on thinking about, talking about, and doing science. The activities develop children's scientific enquiry skills in an enjoyable context with links to the National Curriculum where appropriate.

To start you off, all of the activities within this pack will count towards an award at either Star or SuperStar level.

For more information on how to register and receive your Crest ★ Investigator packs, visit our website at www.britishecienceassociation.org/creststar or call 020 7019 4943.



Thank you for using Food for thought

We hope you enjoyed the activities within this pack. To help us to continue to provide new challenge packs, we'd like to ask you to tell us a little about what you did for National Science & Engineering Week.

Please take a few minutes to fill in this form and return it to the National Science & Engineering Week office.

Name: _____

Organisation: _____

Address: _____

_____ Postcode: _____

Tel: _____ Fax: _____

Email: _____

Which dates did you do National Science and Engineering Week activities on?

What did you do?

Please make any comments about this challenge pack, National Science & Engineering Week and/or other possible topics for future packs.

Please return to:

Fax:	0870 770 7102
Post:	National Science & Engineering Week FREEPOST LON 14913 London SW7 5BR