

Can I blow it up? Can I eat it?

Exploring the science of food

Gill Harrison and Sam Holyman consider how links can be made between food and the curriculum, offering ideas to support science teaching



Figure 1 Children at Bablake School getting hands on as they explore microbial characteristics with the MicroTrumps game

Easy-to-use classroom resources that support science teaching are always welcomed by time-poor teachers. Ideally these resources should be easy to find, useful and have the flexibility to be incorporated with minimal adaptation into our already full teaching day. So Chilled Education (the education section of the Chilled Food Association) worked with classroom teachers to develop such resources. Attention was focused on the ways that food can be used to model scientific ideas as well as looking at how microorganisms are used in industry, how they can be used in investigations and exploring their pathogenic nature.

As teachers and educators one of our main challenges is to engage children. Ideally we want to make a lasting impression, maybe with a memorable hook as part of a starter or a 'big finish' intriguing plenary. We could perhaps start or end a lesson with something to make a big bang (can I blow it up?). Many children are captivated by an explosion, but big bangs can be risky. Sometimes

it is better to work with a material that poses fewer challenges and with which we are all familiar, something we can all relate to, recognise and understand – food is the answer!

We are all looking for the hook to grab the interest of the learner and food offers tangibility, allowing us to teach potentially difficult subjects, such as microbiology, in an accessible and memorable way. Using food in the classroom is certainly not a new idea – especially for primary school teachers. Children can easily relate to food as everyone eats every day. Food can be used to model concepts by making 3D structures with sweets and cocktail sticks. It can also be used to explore the world around us, for example showing how chemicals spread out and mix at different temperatures using tea bags and water.

Think about food and cookery springs to mind, but it offers so much more. Of course it is important that children learn to prepare tasty and attractive food safely. Cooking also offers the opportunity to teach

measurement and capacity, ratio and writing for purpose. And it harnesses creativity, as many children love to cook and decorate their finished biscuits, cakes or pizzas. But food is all about chemistry, biology and even physics. Think about the consistency of chocolate on a digestive biscuit, the way fruit floats in jelly, the popping of popcorn – these are all about science.

On a purely practical level, food is a (relatively) low risk resource when teaching science lessons. By using it we avoid the need for hazardous chemicals. Staff should be aware of any food allergies, of both staff and children, when handling food, and take account of food intolerances if food is to be consumed. There are also religious considerations and preferences such as vegetarianism. These can all be catered for with some creative substitutions and food does not have to break the budget. (For further information on using food and microorganisms in school see *Be safe!*, 2011.)

Box 1 offers a few ideas for using food in science.

Key words: ■ Microorganisms ■ Food science

Box 1 Food! A versatile science resource

Here are some ideas:

- Cut a cross-section of cinder toffee (e.g. Crunchie bar). Look at how the size of the bubbles gets bigger towards the centre. This models how the crystal size of rocks is affected by the rate of cooling when it was being formed. The longer the rock takes to cool, the bigger the crystals, just as the bubbles in the toffee are largest in the centre where the rate of cooling was the slowest.
- Use small sweets with a mark on one side (e.g. Skittles) to model probability. Throw the sweets into a bowl, remove all those with their mark facing upwards and note how many remain. Repeat until there are no sweets left. This can be used to model probability.
- Use different methods for removing dried pasta shapes from a bowl, such as long-nosed tweezers, spoon or toast tongs, and explain that this is to model birds' beaks. Which bird would survive? The one with the beak best adapted to eat the food.
- Create an edible DNA double helix using jelly sweets (or gelatine-free alternative) and toothpicks.

Making sense of microorganisms

Teaching children about microorganisms presents one of the biggest challenges. Their size, shape, variety and numbers potentially make them unfathomable to young minds. Shrouded in mistrust and misunderstanding, lumped together as nasty 'germs', they call for careful explanation. Some are bad for us, many good and quite a few vital to our survival. Their sheer diversity makes them a fascinating subject.

The food industry uses 'good' microorganisms such as yeast to make bread, or bacteria to make yoghurt. But even some 'good' microorganisms can get into the body and cause illness and disease, either by producing toxins that damage cells and tissue, or by other action.

A set of free curriculum-focused Chilled Education resources aimed at primary-aged children is now available to help teach about microorganisms: the MicroTrumps card game, inspired by the popular Top Trumps games (Figure 2). These

were developed by the author Sam Holyman and fellow teacher Kat Stuart, and trialled at primary schools in the Midlands. The cards feature 14 microorganisms including *Listeria monocytogenes*, *Clostridium botulinum* and norovirus. The MicroTrumps game is played along the same lines as Top Trumps, but with a twist. Children use the cards to trump each other in categories such as dangerousness. The game can be played in pairs or in small groups.

These resources can be used for topic-based learning as they can help children understand the importance of hand-washing in PSHCE (personal, social, health and citizenship education), to summarise information by producing their own MicroTrump card for an English focus, and the science focus is learning about microorganisms.

Figure 2 The MicroTrumps card game – beginning exploration of microorganisms



Teaching about microorganisms in science

The MicroTrumps game offers a great starting point for a discussion about the three main groups of microorganisms. The scientific content and subject knowledge they explore is outlined below.

Yeast (fungi)

Yeast is a single-celled fungus with a cell membrane, a hard cell wall and a nucleus. Show children a jar of yeast extract, a loaf of bread and a bottle of beer and ask them to suggest a link. Use questions and answers to encourage them to see that these are all safe to eat or drink although they all rely on a microorganism – yeast – to make them.

Bacteria

Bacteria have cell membranes and soft cell walls but do not have a nucleus. Some have tails (flagellae) that allow them to swim. The cards in Figure 3 give two examples:

- ***Lactobacillus acidophilus*. This is completely harmless and is found in the healthy human gut. It is sold as a health supplement and also used by**

the food industry to make fermented foods such as cheese and yoghurt.



Figure 3 Examples of the MicroTrumps cards with detailed information on bacteria

- ***Staphylococcus aureus*, an example of a harmful bacteria, found in animals' guts (not humans'), it can cause a range of diseases in humans. They can be killed by sustained heating to high temperatures and this is one reason why meat should be properly cooked before eating.**

Viruses

A virus has no cell wall or cell membrane, but is protected by a protein coat. Viruses do not have a

nucleus but have a strand of nucleic acid. They can only reproduce when they are inside another living cell, so some people do not think these microorganisms are alive.

An example is the norovirus (the ‘winter vomiting bug’), which is especially tough and is very infectious (Figure 4). Personal hygiene is very important to control it.

Teaching about microorganisms in PSHCE

The MicroTrumps resources can also be used to teach about microorganisms in other subjects. With the children’s imaginations sparked by the cartoons and information on the MicroTrumps cards, the importance of hand-washing can be explored (Box 2).

Box 2 Hand-washing exercise

Ask children to explain the importance of hand-washing. Ask for three volunteers to demonstrate how to wash hands. Using two bowls of water (one very cold and one warm), give two of the children soap and ask them to wash their hands in separate bowls. Give the third volunteer some alcohol gel. Ask the children to demonstrate how they wash their hands. For younger children you may wish to play the *Washy Washy Clean* video (www.chillededucation.org/videos) and copy the actions.

Make your own microorganism

Once the children have understood what microorganisms are, they can get creative and design their own versions. They should include details about its classification, temperature tolerance, where it can be found and how ill it can make you. The free downloadable resources give template cards and worksheets with full instructions.

Children from Bablake School in

Figure 4 The card for the harmful and very infectious norovirus



Figure 5 The MicroTrumps cards made by the children of Bablake School

(Curriculum levels 2 to 5) were able to access them. The level of engagement while completing the activity of making their own cards was high. The main misconception which was addressed was some children called the images on the cards ‘germs’.

Why does it matter?

Food is something we can all relate to and we all need. While thinking about careers might not be top on your children’s minds at this age, it is worth knowing that the food industry employs thousands of scientists. So, when you ignite a spark of interest in the science of food you could be setting the children off on the path to rewarding, opportunity-filled careers.

The Chilled Food Association (CFA) – the people behind Chilled Education and MicroTrumps – is working with the Association for Science Education to help teachers inspire future generations of food scientists. Their resources have been developed with teachers for teachers. Kaarin Goodburn, Director of the CFA explains:

At any one time there are around 200 science-degree requiring unfilled roles within the chilled food sector. Graduates can earn starting salaries of £23k with the potential to earn much more. There are other benefits too, including professional development and the potential for travel. It is a dynamic, ever-changing industry that offers a real future. After all we all need to eat!

For further information about the MicroTrumps game and other teaching resources visit: www.chillededucation.org

Reference

ASE (2011) *Be safe! Health and safety in school science and technology for teachers of 3- to 12-year-olds*. Hatfield: Association for Science Education.

Gill Harrison handles communications for the CFA and Chilled Education.

Email: gill.harrison@chillededucation.org
Sam Holyman is the Junior Science Coordinator at Bablake Senior School, Coventry.
 Email: SLH@bablake.coventry.sch.uk

Coventry successfully created new cards and carried out the hand-washing exercise (Figure 5). Their teacher, Helen Shorter, said:

The children loved learning about different microorganisms and were amazed at how harmful some can be. I’m sure they will all be washing their hands much more thoroughly in the future!

Children can make their own cards, mixed in with the MicroTrumps, to play a game of ‘MicroTrump Dump’. They deal out the pack of cards. The top card for each player is turned over and viewed by that player alone. The player whose turn it is then chooses which MicroTrump category to compete in. The player with the MicroTrump that has the highest value in that category, or the lowest (such as low pH or temperature for survival in cold) wins all the cards from that round. The next player then has their turn. The object of the game is to have the most MicroTrump cards at the end of the playing time.

Trialling the resources at Audley Primary School, Birmingham

After the successful trial at Bablake School, Kat Stuart arranged for a trial at Audley School in Birmingham (thanks to Rebecca Collenette, year 5 class teacher). This trial, at a school with a range of abilities, showed the accessibility and engaging nature of the resources.

Rebecca explains:

The children were very excited to take part in the trial lesson and were engaged from the onset. Their prior knowledge about this area was very limited. They did not know the links between the three items at the beginning of the lesson [yeast extract, bread and beer]. After a discussion about bread and how it rises one child mentioned yeast. A few others had heard of it.

Rebecca summed up:

MicroTrumps were a huge hit! All abilities (ranging from old National