



Materíals Matter Chocolate

Challenge Pack



This challenge is aimed at KS2 and supports the primary National Curriculum;

KS2 DESIGN AND TECHNOLOGY Design and Make

KS2 HISTORY Local History Study

KS2 SCIENCE Working Scientifically States of Matter Properties of Materials

...as well as promoting team working, problem solving and creativity!

Information for Teachers

The Chocolate Challenge

Introduction

This activity complements a visit to Calderdale Industrial Museum and the KS2 workshop **Materials Matter.** The challenge can also be used as a post visit activity.

Included in this pack;

- Useful Websites and Links
- Pupil Challenge introduction
- Object Photo and Fact File
- Background Information Sheet
- Pupil 'Sparking Ideas' Sheet
- Teacher Notes on activities
- Pupil Activity Sheets
- Pupil Chocolate Investigation Sheet
- Pupil Chocolate Machine Design Sheet



The Challenge

The museum houses a popular display about John Mackintosh who created the modern toffee in his Halifax shop in the 1890s and his son Harold who invented Quality Street, which was first made in Halifax in 1936. The challenge is for pupils to help the museum explain some of the science behind the making of Quality Street. The first part of the challenge is to **research and present information about Quality Street and chocolate making in Yorkshire**, this could be however pupils choose – perhaps in the style of a museum panel or a video aimed at museum visitors. The second part of the challenge is to **investigate chocolate science** and design a brand-new **chocolate melting and moulding machine!** The investigation notes included are to explore temperature of setting the melted chocolate into new shapes. The finished work would make a wonderful classroom display and could also be emailed to the museum for us to see! schools@calderdaleindustrial.co.uk

Resources Required

For the investigation you will need;

Hot water/access to microwave to melt chocolate Chocolate – milk and dark Plastic cups for the melted chocolate Ice in container Paper towels Stop Clocks

Related Lesson Ideas

- Local History Quakers and chocolate making in Yorkshire
- Geography Where Chocolate comes from and how is it made
- Literacy & art Charlie and the Chocolate Factory storyboarding
- D & T and Art & Design Design and make a chocolate box
- Maths Chocolate Box mental maths (worksheet enclosed)
- Making chocolate recipes!

Extension Ideas

- Explore which types of chocolate melts quickest milk, white, dark
- Investigate if the quantity of chocolate affects the time to melt and harden
- Investigate melting points of other substances (ice, butter)

Other Resources

There are videos made with our partner Hargreaves Foundry available on out website.

Useful Websites and links

The following websites and videos have useful information and tips to help pupils research and complete the challenge. Please check they are appropriate and safe for your class before using.

John Mackintosh

http://www.halifaxpeople.com/John-Mackintosh.html

www.toffeetown.org.uk

Quality Street

http://www.qualitystreetchocolates.com/

States of Matter

https://www.bbc.com/bitesize/topics/zkgg87h

Particles

https://www.bbc.com/bitesize/clips/zpbvr82

Properties of Materials

http://www.bbc.co.uk/bitesize/ks2/science/materials/characteristic_material s/read/1/

Challenge Introduction

This toffee boiling machine is on display in the very popular museum's display about Quality Street and Halifax as the home of modern toffee!

We would like to explain more about Quality Street and the science of chocolate making to our visitors. Can you help?



Challenge:

- 1. Design a chocolate melting and moulding machine!
- 2. Create a presentation about chocolate making in Halifax

Object Fact File

Toffee Boiling Machine



What is it?

A Toffee Boiling Machine.

How old is it?

This machine is over 50-years old.

What is it made from?

Copper boiling pan Iron frame

What did it do?

Up to 300lbs of ingredients were boiled in the large copper pan. The liquid toffee was then poured out onto a metal slab. When ready the toffee was broken up into small pieces to be sold.

How does it work?

Copper is a very good material for pans. It is an excellent conductor of heat (fives times better than iron) so the heat spreads evenly across the pan. This also means that it takes less energy to cook with a copper pan. Another benefit is that copper is also corrosion resistant. The toffee was poured onto a cooled metal slab to harden.

Background Information:

Chocolate Making

A Brief History of Chocolate

The first 'Chocolate House' opened in London in 1657, where high society customers could enjoy hot chocolate. Demand for chocolate grow and grocers began to stock and sell chocolate. The growth of the Temperance movement encouraged Victorians to drink cocoa as an ethical alternative to alcohol. Some of the major chocolate companies in Britain were established by Victorian Quaker families - Cadburys, Frys, Terrys and Rowntrees.

The Mackintosh Family

In Halifax a brand-new toffee 'Mackintosh's Celebrated Toffee' was invented by John Mackintosh and his wife Violet by combining hard butterscotch with soft caramel. The recipe used local ingredients like milk, sugar beets and eggs. It was sold as the Toffee De Luxe and was later marketed as 'The King of All the Toffees'.

Quality Street

John's son Harold invented Quality Street in 1936. At that time boxed chocolates were expensive and came in expensive packaging as a luxury item. Quality Street was developed for working family, with individually wrapped toffees covered in chocolate in a brightly coloured tin featuring the characters of Miss Sweetly and Major Quality. Brand new technology was introduced to manufacture Quality Street, including the world's first twist wrapping machine which would wrap each individual chocolate.

Nestle

In 1969 Mackintosh's merged with rival company Rowntree's. Rowntree Mackintosh was in turn acquired by Nestle in 1988. Nestle continues to make tins of Quality Street toffees and chocolates.

States of Matter

Every material exists in one of the three states of matter, solid, liquid and gas.

Chocolate States of Matter

Matter can change from one state to another depending on if you heat or cool them. When solids are heated they became liquid. The melting point for chocolate is 30-32°C, slightly lower than body temperature which is why it will melt in your hand! Chocolate will set (change from a solid to a liquid) at about 16 °C.

Sparking Ideas!

Before you start planning and creating, try some **research** to help with sparking some great ideas! You could use the internet, books, visit the library or even better visit a museum to find out more! Here are some tips to help.



Presentation

Think about **who** will be reading your information and what would they be interested in finding out?

Have a look at **different styles** of museum panels – which do you like the best and why?

What can you find out about **toffee de luxe** and **Quality Street** making in Halifax?

Who are **Miss Sweetly** and **Major Quality**? What was special about the **packaging** and **marketing** of Quality Street?

Design

Research different types of chocolate – including eating them!

What change of state will happen?

What components would your machine need to have?

What materials would you need?

What are the useful properties of the materials you have chosen?

What different temperatures will you need for different types of chocolate?

What will happen to your melted chocolate?

Teacher Notes

Melting Quality Street

Using heat lamps, candle heaters or boiling tubes in bowls of warm water would be alterative ways to test the melting chocolate, if you have them.

Types of chocolate

The results will vary depending on the filling and the types of quality street chocolate. The test can be simplified using white, milk and dark chocolate buttons.

Alternatively you could use one type of chocolate (milk chocolate squares) but investigate the melting point of frozen, refrigerated and room temperature samples.

The higher the cocoa content the slower the chocolate will melt. White chocolate should melt the fastest as it has a high fat content and contains no cocoa (fats have a lower melting point than cocoa). Dark chocolate will melt the slowest as it has the highest cocoa content at 60-70%. Milk chocolate has a cocoa content of about 50%.

Fair test

Discuss the temperature of pupil's hands and that we can't be sure that some pupils had warmer body temperatures or warmed their hands more. The experiment could be improved if we could control and measure the temperature of melting perhaps using hot water and a thermometer. The chocolate may also have been different sizes and weights which could have affected the results.

The key links to the chocolate machine design are;

 consideration for including different temperature settings for melting different types of chocolate

Setting Chocolate Investigation

The investigation is to find out the best temperature to set the melted chocolate into new shapes, thinking about the design for their melting and moulding machine.

Heating can cause an irreversible change, for example after cooking an egg – the egg cannot be changed back to a raw egg.

But somethings the change upon heating is reversible – a change which can be undone or reversed. A reversible reaction is when you can get back the substance you started with, although it might look, feel and even taste different.

Melting chocolate is a reversible change.

Pupils should discover that the cup of chocolate in the beaker of ice solidifies most quickly.

Extension - Dark chocolate is more likely to harden more quickly than milk chocolate.

The key links to the chocolate machine design are;

o a cold surface or mould incorporated for setting the chocolate

Melting Quality Street Activity Sheet

We are going to investigate the rates at which different types of Quality Street chocolates melt.

Work together in groups of five. You are going to get messy!

You will need:

Two each of 4 different Quality Street chocolates Stop Watch



Try this:

Warm your hands up by rubbing them together for one minute

Four people in the group choose a different chocolate each. The fifth person is the timer and checker.

We are going to do the test first with the wrapper on and then without the wrapper.

Hold a wrapped chocolate and close your hands.

Every 60 seconds check your hands and observe the state of your chocolate. Has it melted?

Keep checking every 60 seconds. Record your results – what order did your chocolate melt in?

Now re-run the experiment with the same chocolates, but without the wrappers – did this make the chocolate melt quicker? Was there any effect on the order the chocolates melted?

Was it a fair test? If not, why not and how could you make it fair?

Write a letter to Harold Mackintosh about what you found out about Quality Street.

How would you recommend that Quality Street are stored in shops to keep them 'quality'?

Design a New Chocolate Product Activity Sheet

Actívíty

Quality Street was developed for working family, with individually wrapped toffees covered in chocolate in a brightly coloured tin featuring the characters of Miss Sweetly and Major Quality. Brand new technology was introduced to manufacture Quality Street, including the world's first twist wrapping machine which would wrap each individual chocolate.

You will need:

Different Chocolate Products Internet access Chocolate Product Design Sheet Pencil, Ruler and Colouring materials



Try this:

1. Look at a range of chocolate boxes and products. Choose two to compare.

Draw the chocolates and the packaging. Who do you the customer is? What do you like about the product? What materials have been used to package the chocolates? Will the packaging keep the chocolates fresh? What is the design of the packaging like?

2. On the Chocolate Product Design Sheet have a go at creating your own design for a brand-new product.

Who is your product for? What do the chocolates look like? How are they packaged? What materials are needed for the packaging? What is the name of your product? Does your product have a logo, picture of the products or characters like Miss Sweetly and Major Quality? How much would you sell your product for?

Setting Chocolate Investigation

Chocolate can come in all sorts of sizes and shapes! It can come in bars, buttons, spirals, wrapped!

How many chocolate shapes can you think of?

Chocolate makers often pour liquid chocolate into moulds to set it into its final shape. This investigation is to find out how fast melted chocolate will set at different temperatures (in ice, cold water or room temperature water).

What do you think will happen? What is your hypothesis?

You will need:



Setting Chocolate Investigation Sheet Milk Chocolate squares Dark Chocolate squares Hot water Plastic cups Ice Room Temperature Water Cold Water Stop watches

Try this:

- 1. Work in groups of four.
- 2. Put 3 squares of milk chocolate in 3 cups
- 3. Get your equipment for setting the chocolate ready
- 4. Very carefully melt the cups of chocolate in a bowl of hot water
- 5. Set up the test and start the stop clock;

Test 1: Cup in a beaker of cold water Test 2: Cup in a beaker of ice Test 3: Cup in a beaker of room temperature water

- 6. Using the stop clock time how long it takes for the chocolate in each of your cups to melt. Record your results.
- 7. What happened and why?
- 8. Now repeat the test using dark chocolate squares.
- 9. Compare the results of the dark chocolate and the milk chocolate? Where they different and why?

Pícture Gallery

Toffee Wrapping Machine



Chocolate Boxes on Display





Miss Sweetly and Major Quality

