Tatton Park

6 Week STEM Club

Key Stage 2 & 3

RESOURCE PACK 1

WEEK 1: Measuring the Thermal Properties of Farmyard Materials

OVERVIEW: It is important that animals are suitably housed during the year, especially given the changeable weather conditions. Farm buildings have been specifically developed to ensure that animals remain warm, comfortable, dry and disease free. It is essential that we understand which materials are appropriate for the job, by measuring the thermal properties of each so that suitable conditions can be created.

Equipment:

- Wool
- Wood (lollypop sticks)
- Straw
- 4 tin cans (empty & clean)
- Glue
- 4 thermometers
- Kettle and water
- Masking tape
- Tray
- Record sheet and pens

Instructions:

1. Cover the top rim of each tin with masking tape to cover any sharp edges
2. Use glue and cover each of the tin cans with a different farmyard material - wood/straw/wool/tin (bare can)
3. Line the cans into a trav and fill each 3/4 full with boiling water
4. Put 1 thermometer in each of the cans and record the temperature on your record sheet
5. Take another reading after 10 minutes and repeat every 10 minutes for an hour

Activities and Discussion Points:

1) Create a graph and record all 6 readings for each material
2) Rank all materials in order, according to their thermal properties
3) Discuss why different animals require different levels of insulation

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WEEK 2: Sugar Awareness Quiz - Healthy Eating and Lifestyle

OVERVIEW: For us to remain happy and healthy, it is essential that we moderate the amount of sugar in our diets. We do need a small amount of sugar, as an essential part of a balanced diet, but too much can result in health problems, poor teeth and weight gain. Sugar is found in some food that you perhaps wouldn't expect and it is sometimes very surprising just how much is contained inside some of our most loved foods.

Equipment:

- 1 can of coke
- 1 tin of beans
- 1 bottle of tomato ketchup
- 2 digestive biscuits
- 1 Pot Noodle
- 1 box of Crunchy Nut cereal
- 1 Mars bar
- 500g of sugar
- Set of scales
- 7 large plastic bags
- Funnel

Instructions:

1. Lay out all of the food stuffs on the table
2. Organise in a line from what you think contains the most to the least sugar
3. Ask each participant to record a guess of how much sugar they think is in each item - knowing that 1 teaspoon of sugar (or one sugar cube) weighs 4 grams
4. Next, run through each item in turn and weigh out the equivalent sugar it contains (see attached sheet) and use the funnel to tip it into a plastic bag. Allow everyone to feel the weight of each bag
5. Reorganise your line of food stuffs (if necessary) to reflect most to least sugar content

Activities and Discussion Points:

1) Record the accurate sugar content beside your guesses and work out the difference between them - how accurate were you? Who was the most accurate?

2) Are you surprised how much sugar is contained in these foods?

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WEEK 2: Sugar Awareness Quiz - Healthy Eating and Lifestyle (Page 2)

Below is a list of the food stuffs used for the Sugar Awareness Quiz and how much sugar they contain. You may wish to substitute some items and replace with something else of your choice - this is just a starting point.

Remember to keep packets closed, as some children may have allergies.

- 1 can of coke (36g)
- 1 tin of beans (24g)
- 1 bottle of tomato ketchup (88g for bottle, 4g per serving)
- 2 digestive biscuits (4g for two biscuits, 68g per packet)
- 1 Pot Noodle (6g)
- 1 box of Crunchy Nut cereal (176g per packet, 12g per serving - 30g of cereal)
- 1 Mars bar (32g - 51g bar)

4g sugar = 1 teaspoon of sugar = 1 sugar cube

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WEEK 3: Making Ice Cream Without a Freezer

OVERVIEW: Farmyards have an abundance of milk and there are various food products that can be made using this key resource. Whilst milk can be consumed in its raw state, we can also look at changing the physical properties of the milk to create different products. In the past, refrigeration units were not available, so ice cream was made using manual methods for both churning and freezing.

Equipment:

- 1 tablespoon of sugar
- 120ml of milk
- 120ml of double cream
- 1/4 teaspoon of vanilla extract
- 1kg of ice cubes
- 7 tablespoons of salt (big crystals work best, add 2 more tablespoons if you use table salt instead)
- 2 re-sealable plastic food bags
- Towel
- Bowl or large jug
- Whisk

Instructions:

1. Whisk the milk, double cream, vanilla extract and sugar in a large bowl or jug. Pour the mixture into one of the bags, seal and set aside
2. Put some of the ice and the salt into the second bag. Put the sealed bag with the ice cream mixture inside the ice bag and then add more ice and salt. The ice cream mixture should be sealed in its bag and not get in contact with the salt
3. Wrap this bag in a towel and shake until the cream mixture has frozen. This will probably take about 10 minutes. Eat it straight away

Activities and Discussion Points:

1) Ice has to absorb heat energy in order to melt and change from a solid to a liquid – it is an endothermic process

2) When you add salt to the ice, it lowers the freezing point of the ice, so even more energy has to be absorbed from the environment (and the ice cream mix) in order for the ice to melt. This makes the ice colder than it was before, which is how your ice cream freezes.

3) Ice cream can be made even faster using liquid nitrogen, which is at -196˚C. Look online to see the chef Heston Blumenthal and a record breaking litre of ice cream!

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WEEK 4: Making a Barometer to Predict the Weather - The Importance of Understanding the Conditions

OVERVIEW: Seasonality and weather both have enormous impacts on the farmyard. They impact crops (in terms of what can grow, how well and when) and the animals (in terms of when they breed, when they give birth and what their care requirements are). Weather forecasts and predictions of the impacts of season change are essential pieces of information for farmers to allow them to yield best results all year around.

Equipment:

- A glass jar
- A balloon
- A rubber band
- Scissors
- A straw
- Sticky tape
- Paper
- Pen
- Record sheet or note-book

Instructions:

1. Cut the bottom half off the balloon and pull the top half tight over the top of the jam jar
2. Use the elastic band to secure
3. Fix the straw to the centre of the balloon skin (lying down flat against the skin)
4. Place the paper so that it is lined up with the straw. It works best to pin it up against a wall. Draw a line at this position
5. Above the line, write HIGH and below the line, write LOW
6. Mark down the position of the straw each day - this gives you the air pressure. Monitor for 1 week and compare your findings

Activities and Discussion Points:

1) As the air is sealed inside the jar, any changes to the air pressure outside the jar will result in direct movement of the balloon rubber. As the outside air pressure increases, the rubber will be forced down into the jar. The straw pivoting on the glass will rise upward. The opposite is true when the pressure decreases.
2) What does air pressure tell us about the weather?
3) Plot your findings on a chart and compare with your colleagues. How did you ensure it was a fair test?

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WEEK 5: Bread Experiment - Investigating the Effects of Different Materials

OVERVIEW: The way that grain is milled and consequently, how bread is produced, has changed over time; both in terms of the equipment used and the role of humans in the process. There is such a wide variety of bread available in supermarkets today, but do we really know what the differences are? What ingredients can be added to bread and how does that change their properties?

Equipment:

- A variety of different types of bread (for instance wholemeal, no salt, extra salt, rye bread etc) - you can make these in advance by using the recipe overleaf and altering ingredients, or pre-purchase
- Knives
- Rulers/measuring tape
- Record sheet and pens

Instructions:

1. Lay out all the varieties of bread in their full loaf form
2. Complete a record chart recording for each type of bread: ***shape, surface features, colour (inside and out), texture, taste, height (in mm) and any other interesting comments or observations during the task***

Activities and Discussion Points:

1) How much difference was there between the different types of bread?
2) What ingredients were added to the breads and what difference did those ingredients make to the shape/structure/taste etc?
3) How has the milling process changed over time? Do some research to find out!

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WEEK 5: Bread Experiment (Page 2)

Below is a basic recipe for bread and some suggested amendments to make, if you wish to produce your own loaves for the experiment. If you have time, students could prepare the bread as part of Food Technology, or each student could make one at home and bring it with them to Science Club.

Basic bread ingredients

- 200g Strong white flour
- 1 x 7g sachet quick yeast
- 1 x 5ml spoon salt
- 125ml warm water

Equipment

Weighing scale, measuring jug, sieve, measuring spoons, mixing bowl, mixing spoon, timer, loaf tin, cooling rack.

Basic method

1. Preheat the oven to 220 degrees or Gas Mark 7 and grease/line the loaf tin.
2. Sieve the flour into the mixing bowl and stir in the yeast and salt.
3. Make a well in the flour and add the water.
4. Mix for two minutes, forming a soft dough.
5. Place the dough on a floured work surface and knead for 10 minutes.
6. Put the dough into the loaf tin and leave to prove for 30 minutes.
7. Bake for 25 minutes and then remove from the tin and allow to cool.

Changes: 1) swap to strong wholemeal flour, 2) swap to plain white flour, 3) remove all salt from the recipe, 4) add 3 teaspoons of extra salt, 5) use 100g of strong white and 100g of strong wholemeal flour, 6) add 50g of caster sugar, 7) swap to brown flour

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WEEK 6: Understanding the Digestion Process

OVERVIEW: Animals (including humans) digest food in the same way. Understanding this process helps us appreciate how food is passed through our bodies and how nutrients are extracted. The different rates at which the process occurs (with some animals digesting at a faster/slower rate than others) can then help us understand the quantity and frequency of food required by various different species - ourselves included!

Equipment:

- 1/3 banana
- 1 cream cracker
- Paper cup with hole in bottom
- 50ml water
- 100ml orange juice
- Sealable plastic sandwich bag
- Scissors
- Stocking or one leg of a pair of small tights
- Paper towels
- Metal tray

Instructions:

1. Put the banana and cracker into the bag - this emulates swallowing the food
2. Add the orange juice (represents our stomach acid) and the water (represents our saliva) to the bag - this emulates the first stage of digestion
3. Mash the food together - this emulates our stomach walls breaking the food down. Continue this for 2-3 minutes
4. Cut the bottom off a plastic cup and insert the remainder into the top of the stocking/tight leg. Snip a hole in the corner of the plastic bag and pour the liquid into the cup 'funnel' and into the stocking/tight leg - this emulates the food passing through the small intestine
5. The product that seeps out through the material represents the nutrients separated from our food
6. Tip the contents of the stocking/tight leg into the cup with a hole in the bottom. Then place another plastic cup inside this and push down. This forces the remaining food product through the hole in the base of the cup - this emulates product that we cannot digest passing through our large intensive and then ultimately being removed as faeces

Activities and Discussion Points:

1) What do you notice about the ratio of 'nutrients' to 'faecal waste'?
2) What does this suggest about the importance of ensuring we have food with a high nutrient content?
3) Knowing that animals require greater quantities of food than humans, what does this tell you about their digestion process?

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