CREST AWARDS | SUPERSTAR

WELLCOME GENOME CAMPUS
CONNECTING SCIENCE
PUBLIC ENGAGEMENT

DNA and the world around you challenges

Suitable for **7 to 11-year-olds**

Developed with support from the Wellcome Genome Campus' Connecting Science Public Engagement team, this collection of CREST SuperStar activities allows children to explore the everyday nature of genetics and learn more about themselves in the process. Once they complete eight of the challenges, they can receive a CREST SuperStar certificate and badge!

#Genome #Genes #DNA #Adaptation #Microorganisms

Start using CREST SuperStar

The activities in this pack have been selected from our library of CREST SuperStar challenges. Children need to complete eight challenges to achieve a CREST SuperStar Award. If you want, you can mix and match challenges from different packs, as long as children complete eight SuperStar challenges.

Preparation

1. Start by signing up for a CREST account: **crestawards.org/sign-in**
2. Select SuperStar Award and download a SuperStar Passport. Use the Organiser Cards in this pack to prepare for each challenge

Run the challenges in this pack

1. Each challenge will take 45 minutes to an hour and involves hands-on investigation, decision making and group discussion. Children can use the Passport to keep track of the challenges they have completed.
2. Once you've completed all eight activities, log back into your CREST account at: **crestawards.org/sign-in**
3. Tell us about the children and the challenges they completed.
4. Finally, complete the delivery and payment details to order your certificates and badges.
5. Congratulations on completing CREST SuperStar!
6. If you want to use your own activities, that's fine! Find out more about what a SuperStar activity should look like here: **bsa.sc/crest-guiding-principles**

Unless stated, no external links have been checked by CLEAPSS. Safety checked but not trialled by CLEAPSS.

CLEAPSS

What next?

Why not challenge children further and try a full day project next? A CREST Discovery Day is a one day facilitated project, ideal for ages 10+. You can find out more and download all the resources you need here: **discoverylibrary.crestawards.org**

Encourage others to take part in CREST projects. To get more ideas on how to get started visit: **crestawards.org**

Contents

The Wellcome Genome Campus in Cambridge is one of the world's largest DNA research centres. It is home to world famous institutes such as the Wellcome Sanger Institute and EMBL-EBI. The campus was the UK base for the **Human Genome Project**, a huge international project that decoded the complete DNA code of humans for the first time. Research at the campus now covers a broad range of science from how changes to DNA has an impact on our health to determining the genetic code of all 66,000 species found in the UK.

But what is DNA and why is it so important to understand and study it?

DNA is an amazing molecule that contains the biological instructions to make all living things including us! Everyone's DNA is slightly different – this is what makes us unique. That is why we can use it to understand how all living things work, including us, as well as finding out about people and creatures from the past and solving crimes.

The study of DNA and genomes is playing an increasing important role in everyone's lives, all around the world, from fighting diseases and finding new medicines to growing better crops and protecting endangered species.

This CREST Super Star pack supported by **Wellcome Genome Campus** Public Engagement helps to bring together 8 different activities that allow children to explore the impact of DNA, genes and genomes on us, our family and our everyday lives.

CREST AWARDS | SUPERSTAR

Ancient animals

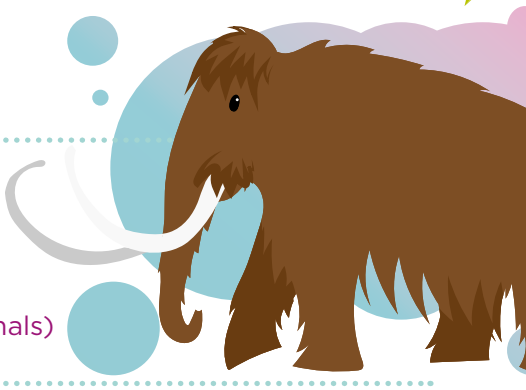
Organiser's Card

About the activity

This activity is designed to get children thinking about animals that lived in the past. Cosmic and Gem are reading a story about a scientist that uses DNA to bring back extinct animals. Cosmic thinks it would be cool to bring back the woolly mammoth, but Gem doesn't think it would survive in today's world.

Through this activity you will support your group to:

- Learn about different animals that lived during different periods in the past, exploring what we know about them and how
- Think about what could happen if different animals were brought back
- Present their ideas



Kit list

- Poster making materials
- Access to the internet (or printed materials about different extinct animals)

What to do

1. Introduce the activity using the story from the Activity Card, ask the group if they know any extinct animals and if they think it would be a good idea to bring them back
2. Introduce the children to DNA and explain that is it a code that provides instructions for your genome, which contains all the information to build your body. Use the links below to introduce this topic.
3. Give out the Activity Cards and poster making materials to the group
4. Explain that they will be researching and making posters about extinct animals, this could be done in pairs or small groups
5. Support the children to conduct their research and record their findings
6. Support the children to make their posters with information about their chosen extinct animal
7. Ask the children to present their findings to the rest of the group. They can be as creative in their presentation as they want, for example, they might like to act out the behaviour of their extinct animal

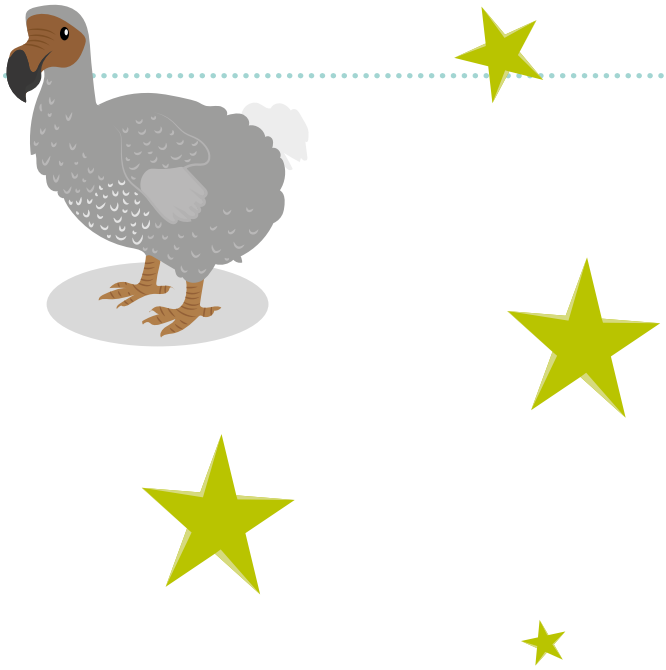
Things to think about

There are some online resources that you may wish to use to support these activities:

- What is DNA? **yourgenome.org/facts/what-is-dna**
- What is a gene? **yourgenome.org/facts/what-is-a-gene**
- What is a genome? **yourgenome.org/facts/what-is-a-genome**
- **bsa.sc/national-geographic**
- **bsa.sc/woolly-mammoth**
- **bsa.sc/tasmanian-tiger**

Keywords

- DNA
- Extinct
- Genetics
- Genome



CREST AWARDS | SUPERSTAR

Ancient animals

Activity Card

Cosmic and Gem are reading a story about a scientist that uses DNA to bring back extinct animals.

Uncle Astro

"It's not possible to bring extinct animals back using only their DNA, but some scientists think it might be possible in the future"

Cosmic

"It would be really cool if we could bring back the Woolly Mammoth"

Gem

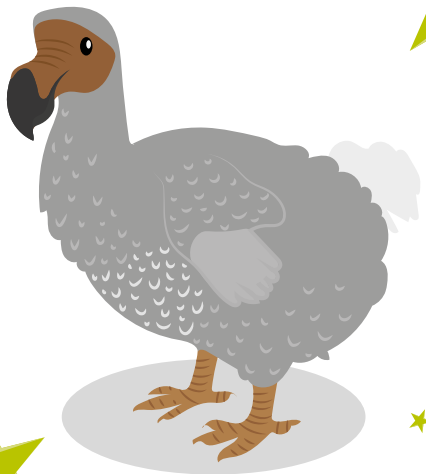
"But the Woolly Mammoth wouldn't be able to survive in today's world because the environment is too different"

Aunt Stella

"Even though we can't bring them back, we can learn a lot of things from the DNA of extinct animals"

Your challenge

Find out about different animals that are now extinct. What do we know about them and how? Think about which animal you would like to see - what would happen if we brought it back from extinction?



Discuss

Can you name any extinct animals?

Do you think they could survive today?

What would happen if they were brought back? Where would they live? What would they eat?

What do you think we can learn from the DNA from ancient animals? How do you think scientists find their DNA?

Getting started

Search online to see what you can find out about some extinct animals.

Where did they live? What did they eat? How did they move? What did they look like?

If you're stuck you could try searching for woolly mammoth, dodo, woolly rhinoceros or thylacine.

DNA is a code – how do you think scientists would use DNA to bring back extinct animals?

Test your ideas

What do we know about them? Is there any written record of a human seeing them alive? What do we know from their skeleton and what do we know from their DNA?

Share your ideas

Why not present your poster to the class, or use it as a wall display?

CREST AWARDS | SUPERSTAR

Contamination detectives

Organiser's Card

About the activity

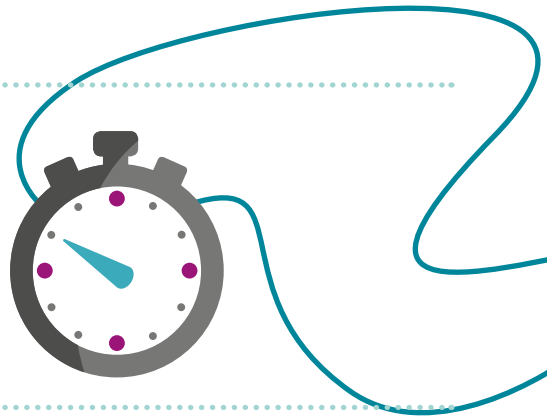
This activity is designed to get children thinking about how microbes spread. The nurse at Startown Primary says it's important to wash your hands to stop the spread of illness and diseases, is she right? Using glitter mixed with hand lotion, children will investigate the role of hand hygiene in preventing contamination.

Through this activity you will support your group to:

- Learn about microbes and their role in the spread of disease
- Design and conduct a contamination experiment to find out if handwashing has an impact on the spread of microbes, testing different techniques
- Record, evaluate and share their results

Kit list

- Different colours of biodegradable glitter and hand lotion
- Handwashing facilities
- Pens and paper
- Stopwatches (optional)



What to do

1. Introduce the activity using the story from the Activity Card. Ask the children if they think washing their hands is important and why? Discuss how harmful microbes (bacteria) can be easily spread through families and communities due to poor hygiene.
2. Give out the Activity Cards and equipment from the kit list.
3. Explain that they will be designing and conducting an experiment to find out how effective different methods of handwashing are.
4. Support the children to design their experiments. Encourage children to discuss their ideas and how to carry out their investigations.

   Prompt questions:

   - What different styles of handwashing could they test? How will they test them?
   - How will they record their results? (There is a suggestion on the Activity Card)
   - How will they make sure their test is fair? For example, if using a bowl of water to ' wash their hands, will they need to change the water frequently?
5. Support children to conduct their tests and record their own results. They could also take photographs or make drawings.
6. Ask the children to present their findings to the rest of the group.

Things to think about

The glitter mixed with hand lotion provides a good (and fun) representation of microbes, however it does not respond to soap or temperature of the water in the same way that microbes such as bacteria do. Make sure to emphasise this to the children and explain that it can only be used to test different styles of handwashing (e.g. rinsing vs. scrubbing, length of time etc.).

Consider whether using bowls of water or a tap would be more effective for children to test their hand washing.

Keywords

- Microbes
- Contamination
- Hygiene
- Prevention

Watch out!

Some children may be concerned at the idea of putting 'germs' on their hands, make sure to emphasise that the glitter is not real microbes, and is completely safe to use.

Glitter is non-toxic and non-staining. However, please ensure:

- glitter is applied to hands only
- students do not to touch their or anyone else's face whilst the glitter is on their hands
- all students wash their hands thoroughly at the end of the activity. Supervision may be required to ensure all glitter is removed. Ensure water is below 41°C to avoid scalding.
- Please check that the glitter you use is suitable.

Children may be allergic to ingredients in the hand lotion, baby oil could be used instead

Extra things to do

You could encourage students to investigate how the 'germs' on their hands can spread onto different objects, such as door knobs or table tops.

Encourage children to discuss why scientists may study bacteria. Use this link as an introduction: **yourgenome.org/video/life-in-the-lab-working-with-human-gut-microbiota**

Have a discussion around the differences between good and bad bacteria.

CREST AWARDS | SUPERSTAR

Contamination detectives

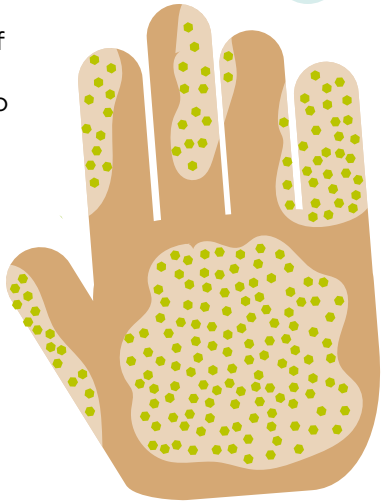
Activity Card

Posters have appeared all over StarTown Primary, saying it's important to wash your hands to stop the spread of illness and diseases.

Class 5 want to find out if washing your hands really makes a difference.

Your challenge

Can you help Class 5 find out if washing your hands helps stop the spread of illness? Using glitter to represent generic "bacteria" and "viruses" that can be spread through human contact, try out different styles of handwashing to see if it works and which technique is most effective.



Discuss

Is it important to wash your hands? If so, when is it important?

How long do you normally wash your hands for?

What is the best way to wash your hands?

Do you think all bacteria are bad? Can bacteria ever be helpful?

The glitter you are using is visible to the human eye. Do you think germs are usually visible in the same way?

Getting started

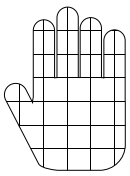
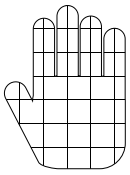
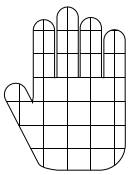
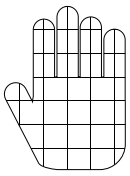
How will you test your ideas to see which works best?

How will you make it a fair test?

Test your ideas

How will you record your findings? Could you make a table or a graph to show your results, like the one below?

Maybe you could colour in grids like this one to show how much of the glitter was left and compare how effective the different handwashing techniques are.

Handwashing technique	Glitter left on hand after washing
No handwashing	
Rinsing for 5 seconds	
Rinsing for 10 seconds	
Scrubbing for 5 seconds	

Share your ideas

Tell the rest of the group about your results. Was it harder to wash the glitter off particular areas of the hands?

Do you think your experiment was fair? Could you do anything to improve it?

Will you change anything about the way you wash your hands in the future?

Extra things to do

Have a group discussion - why do you think scientists study bacteria and viruses. What can they learn from them? Do bacteria have DNA too?

CREST AWARDS | SUPERSTAR

Fascinating faces

Organiser's Card

About the activity

This activity is designed to introduce children to the ways in which DNA can be used to investigate the past. Class 5 at Startown Primary School are visiting the local history museum. They see some models of people from different periods in the past. Gem wants to know how archaeologists can know what the people looked like when we only have their skeletons and no photos. Using DNA decoder cards, children will explore what physical characteristics can and cannot be identified from ancient skeletons.

Through this activity you will support your group to:

- Learn about the chemical letters that make up DNA, and how these can influence appearance
- Decode DNA sequences from ancient skeletons
- Draw or make a mask of their decoded DNA person

Kit list

- Profile cards (one set per table)
- Paper and colouring pens or pencils

If making masks:

- Papier-mâché mask (one per pupil)
- Wool for hair
- Sticky tape or glue
- Scissors
- Ping pong balls or newspaper rolled into a ball for eyes

What to do

1. Introduce the activity using the story from the Activity Card. Ask the children if they have heard of DNA or genes. Discuss why some people look alike and some people look different.
2. Explain that they will be decoding DNA from real skeletons, using this to recreate the faces of Anglo-Saxon and Iron Age people
3. Demonstrate to the pupils how to use the DNA decoder card. Explain to the class that they first need to write down the identifying number of their chosen skeleton and the era it is from. Then they need to work through the list of genes in their profile and decode each one. They will need to refer to this when recreating their face!
4. Ask pupils to look at the profile cards on their table and to each choose one profile to decode. Support the pupils to decode their chosen skeleton DNA.
5. Once the children have finished their decoding, encourage them to discuss what DNA might affect and what the environment might affect instead. They could think about height, weight and health or even personality.

Things to think about

There are some online resources that you may wish to use to support these activities:

- What is DNA? **yourgenome.org/facts/what-is-dna**
- What is a gene? **yourgenome.org/facts/what-is-a-gene**
- What is a genome? **yourgenome.org/facts/what-is-a-genome**
- What is genetic variation? **yourgenome.org/facts/what-is-genetic-variation**
- See how DNA is decoded: **youtube.com/watch?v=c6eCRiMM79w**

Keywords

- DNA
- Genome
- Gene
- Generation
- Archaeology

Watch out!

If you are making masks it will probably get messy!

Extra things to do

Once children have decoded all their information they could use the details to draw their face on the worksheet or make their mask (they might like to sketch out their design first).

CREST AWARDS | SUPERSTAR

Fascinating faces
Profile Cards

In the United Kingdom, Iron-Age peoples lived just under 2000 years ago, while Anglo-Saxons lived around 1000 years ago.

Skeleton 241	Anglo-Saxon woman	Gene	DNA clue
		Eye colour	GG
		Hair colour	CT
		Hair type	GG
		Freckles	CT

Skeleton 355	Anglo-Saxon woman	Gene	DNA clue
		Eye colour	GG
		Hair colour	TT
		Hair type	GA
		Freckles	CC

Skeleton 1231	Iron Age man	Gene	DNA clue
		Eye colour	GA
		Hair colour	TT
		Hair type	AA
		Freckles	TT

Skeleton 1964	Iron Age man	Gene	DNA clue
		Eye colour	AA
		Hair colour	CT
		Hair type	GA
		Freckles	CT

Skeleton 5518	Anglo-Saxon man	Gene	DNA clue
		Eye colour	GA
		Hair colour	CC
		Hair type	GG
		Freckles	TT

CREST AWARDS | SUPERSTAR

Fascinating faces

Activity Card

Class 5 at Startown Primary School are visiting the local history museum. Mr Stoneage, the museum archaeologist, shows them some models of people from different periods in the past.

Gem: 'How do you know what the people looked like when we only have their skeletons and no photos?'

Mr Stoneage: 'We use a technique called facial reconstruction. By looking at the bone structure of the skull, such as distance between the eye sockets and the shape of the nasal cavity (the nose).'

Gem: 'Cool! Can you also tell which of them have curly hair and some have straight hair?'

Mr Stoneage: 'Not from just the skeleton, but we can by looking at their DNA - deoxyribonucleic acid.'

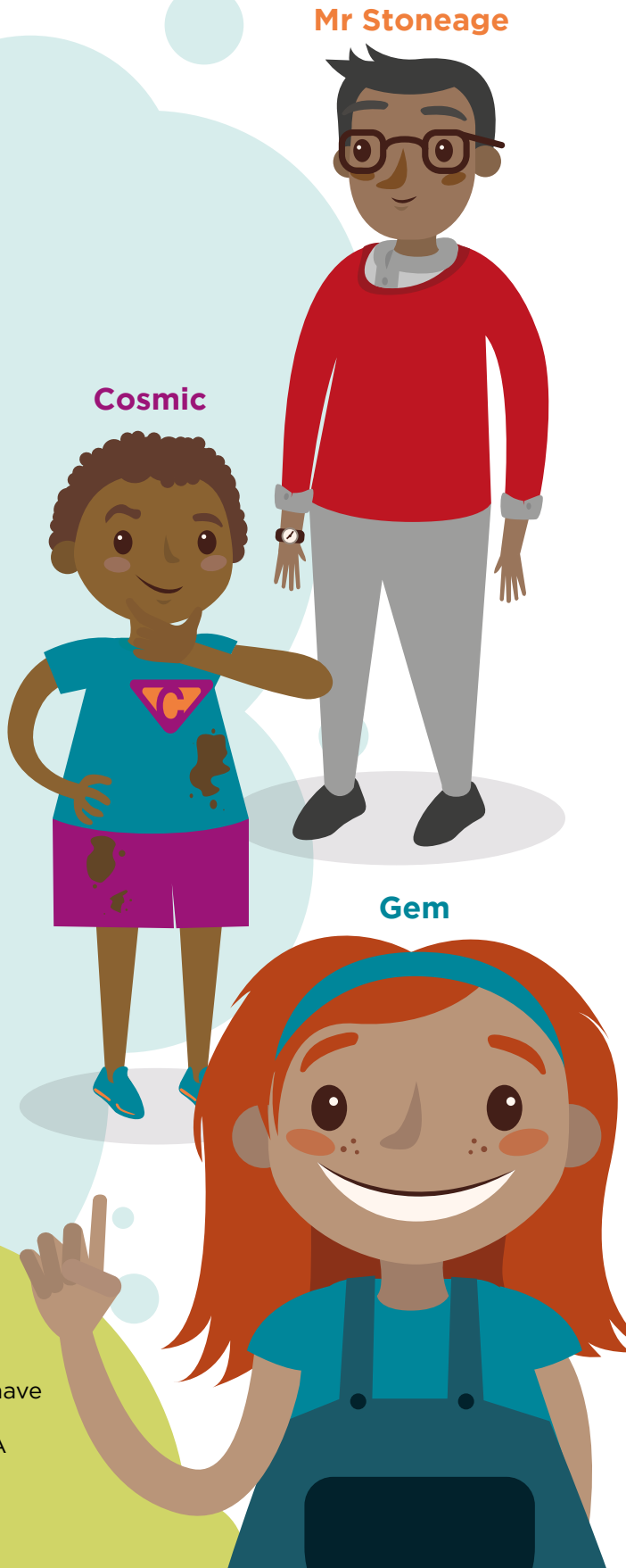
Cosmic: 'What's DNA?'

Mr Stoneage: 'DNA is a long molecule in every cell, it contains all the instructions for making a living thing. All of the DNA in a cell is called the genome, and within the genome there are sections of DNA called genes.

Genes provide instructions for our individual characteristics, and sometimes there can be small differences that alter the outcome, like giving some people brown eyes and other people blue eyes.

So, by looking at the DNA in the cells of these skeletons we can read the instructions, written in the four chemical letters of DNA: A, C, G, and T. The order of these letters provides instructions and can help us understand a little bit about how they looked.

Actually we have the DNA code of some new skeletons, can you help us decode them?'



Your challenge

Can you help Mr Stoneage figure out what the people would have looked like? Choose the profile card of the skeleton that you'd like to decode and match the DNA clue to the one on the DNA decoder card.

Discuss

Why do some people look alike and some people look different?

Do you share any features with members of your family, for example, the same hair colour or eye colour?

What things wouldn't we be able to find out from DNA or skeletons? Would you be able to tell if someone had been in a battle and had a scar on their face?

Do you think there are some characteristics that are affected by our surroundings, rather than our DNA? Think about height, weight, health or even your personality!

Where do you think archaeologists find DNA on skeletons? Why do bones last longer than hair or skin?

Getting started

DNA Decoder: The letters in DNA are important, because a change in the order can change the instructions, which can lead to difference in particular traits such as eye colour or hair colour.

Gene	DNA clue	Face feature
Eye colour	AA	brown eyes
	GA	green eyes
	GG	blue eyes
Hair colour	TT	blonde hair
	CT	brown hair
	CC	black hair
Hair type	GG	curly hair
	GA	wavy hair
	AA	straight hair
Freckles	TT	lots of freckles
	CT	some freckles
	CC	no freckles

Test your ideas

Write down the details of your Profile Card, using the DNA decoder to fill in your chosen skeleton's DNA code'

Skeleton ID:

Time period:

DNA code:

Sex	Man	Woman	
Eye colour	Brown	Green	Blue
Hair Colour	Blonde	Brown	Black
Hair type	Curly	Wavy	Straight
Freckles	Lots	Some	None

Circle the characteristics that your skeleton has

Share your ideas

Use your findings to draw or make a model of how the person you decoded would have looked like.

BRITISH SCIENCE ASSOCIATION

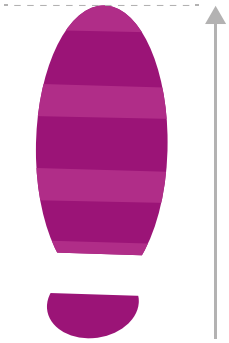
CREST AWARDS | SUPERSTAR

Forensic footprints

Organiser's Card

About the activity

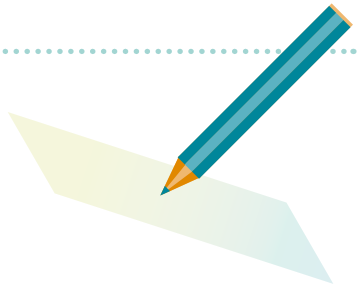
This activity is designed to introduce children to forensics and its applications in solving crimes. Things have been going missing from Class 5 at StarTown Primary. A mysterious footprint has been left on the classroom floor and Gem thinks that they can use forensics to figure out who is responsible. Just like a real detective, she says they can use the footprints to work out how tall the suspect is.



Through this activity you will support your group to:

- Learn about how maths and forensics can be used together
- Survey some adults to collect their feet size and height
- Record and analyse their results to work out the ratio, and use this to solve the mystery of who has been moving things from Class 5's classroom

Kit list



- Tape measure
- Pen
- Paper
- Printed image of a shoeprint that is 28 cm long

What to do

1. Introduce the activity using the story from the Activity Card. Ask the children if they have heard of forensics and what they think it can be used for? Discuss the uses of forensics in solving crimes.
2. Give out the Activity Cards and equipment from the kit list.
3. Explain that they will be designing and conducting an experiment to find out if there is a relationship between foot size and height.
4. Support the children to design their experiments. Encourage children to discuss their ideas and how to carry out their investigations. Prompt questions:
    - How will they measure and record their results? (There is a suggestion on the Activity Card)
    - How will they make sure their test is fair?
5. Support children to conduct their tests and record their own results (they could also take photographs or make drawings).
6. Ask the children to present their findings to the rest of the group.

Things to think about

The ratio between foot size and height is most accurate in adults, so you will need to find some willing adults to have their feet and height measured!

To make sure it's a fair test, the children should use the left foot for all the adults.

Children will use the height and shoe length they get from adults in their school to plot a trend line. They will then be able to use this to figure out the most likely suspect from those listed on the Activity Card

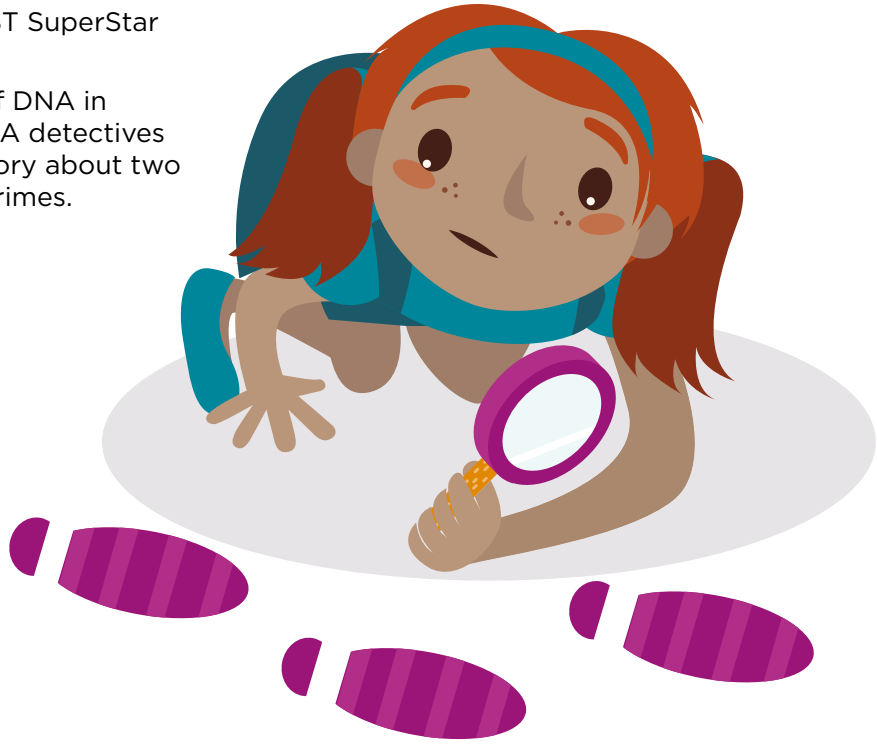
Keywords

- Trend line
- Forensics
- Correlation

Extra things to do

Try the Fascinating Fingerprints CREST SuperStar activity for more forensics!

If students are interested in the role of DNA in forensics, recommend reading the DNA detectives books by Mandy Hartley, a fictional story about two children who use DNA to help solve crimes.



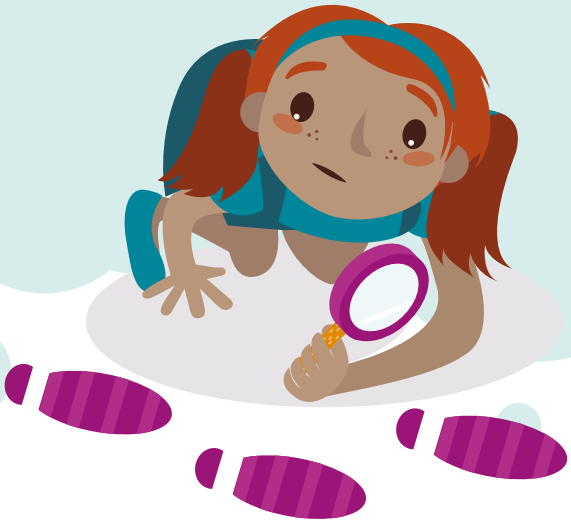
CREST AWARDS | SUPERSTAR

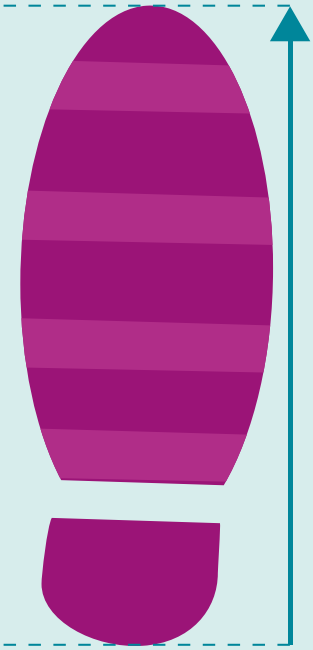
Forensic footprints

Activity Card

Things have been going missing from Class 5 at StarTown Primary. Last week, Gem left her colouring pencils out and after lunch they were gone. Yesterday, Cosmic left his jumper in the classroom and this morning it wasn't there anymore.

A mysterious footprint has been left on the classroom floor and Gem thinks that they can use forensics to figure out who is responsible, just like a real detective. She thinks they can use the footprints to work out how tall they are.





Height of suspects:

Mrs Teachem: 153cm

Mr CleanUp: 187cm

Nurse: 160cm

Gardener: 198cm

Your challenge

Can you help Class 5 figure out who has been moving their things? Is there a relationship between foot size and height in adults?

Discuss

What do you think the relationship will be between foot size and height?

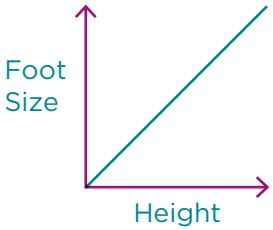
How will you calculate the relationship between foot size and height?

Getting started

You'll need to find some adults who don't mind having their feet and height measured. You will need to measure the length of their foot from the heel to the tip of the big toe.

Test your ideas

How will you record your findings? Could you make a graph to show your results? How will you use your findings to calculate the relationship between foot size and height?

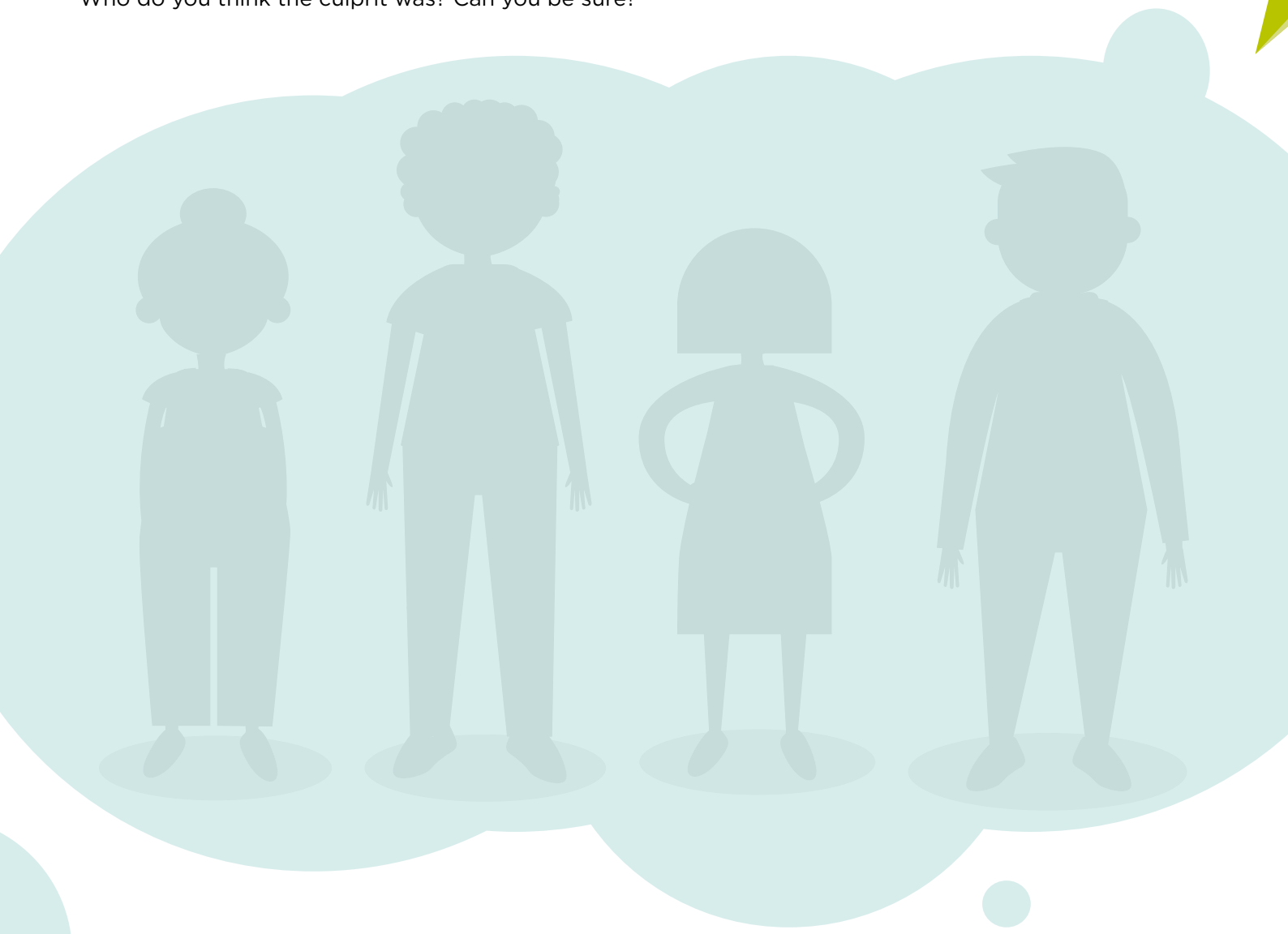


Share your ideas

Tell the rest of the group about your results.

Do you think your experiment was fair? Could you do anything to improve it?

Who do you think the culprit was? Can you be sure?



CREST AWARDS | SUPERSTAR

Freckle finders

Organiser's Card

About the activity

This activity is designed to get children thinking about why some people look alike and some people look different. Cosmic and Gem are drawing self-portraits. Cosmic notices Gem drawing freckles on her face and wonders why he doesn't have any. Gem wonders why some people have straight hair and others have curly hair. Aunt Stella says our DNA can influence our appearance, such as our eye colour, hair colour, skin tone and face shape. She says we inherit our DNA from our parents so some features are passed down from generation to generation. Are freckles and curly hair influenced by our DNA as well?

Through this activity you will support your group to:

- Learn about DNA and how it can influence our appearance
- Design and conduct a class survey of different features
- Discuss which characteristics they think are most determined by genes and which could be down to other factors, such as learning or environment

Kit list

- Pen
- Paper

What to do

1. Introduce the activity using the story from the Activity Card. Ask the group if they have heard about DNA or genes before. Discuss why some people look alike and some people look different, introducing the idea of genetic variation.
2. Explain that they will be designing and conducting a class survey to find out how many people have different features, and whether or not members of their family share the same features.
3. Support the children to design their survey, conduct their research and record their findings.
4. Encourage the children to have a discussion around the ethics of undertaking the survey.
5. Ask the children to present their findings to the rest of the group.

Things to think about

There are some online resources that you may wish to use to support these activities:

- What is DNA? **yourgenome.org/facts/what-is-dna**
- What is a gene? **yourgenome.org/facts/what-is-a-gene**
- What is a genome? **yourgenome.org/facts/what-is-a-genome**
- What is genetic variation? **yourgenome.org/facts/what-is-genetic-variation**

Keywords

- DNA
- Gene
- Generation
- Inherit
- Variation

Watch out!

Be aware of ethical issues to children carrying out surveys with friends and family about genetic inheritance. Some childrens' parents may be different to their biological parents. Discuss these issues with children before they carry out their survey and make sure individuals can't be identified in the data they collect.

Extra things to do

Encourage your students to think about other characteristics that might be affected by DNA, such as taste, smell or even ear wax type. Visit **yourgenome.org/activities/investigate**

CREST AWARDS | SUPERSTAR

Freckle finders

Activity Card

Cosmic and Gem are drawing self-portraits.

Cosmic: 'I like your freckles Gem, I wonder why I don't have any?'

Gem: 'I like your curly hair Cosmic, I wonder why my hair is straight?'

Cosmic: 'My mum says I get my curly hair from her.'

Gem: 'How did she give it to you?'

Aunt Stella: 'She gave it to him through DNA. Our DNA can influence lots of things, like our eye colour, hair colour, skin tone and face shape. We inherit our DNA from our parents, so some features are passed down from generation to generation.'

Gem: 'Are freckles and curly hair influenced by our DNA as well?

Your challenge

Find out what different features people in your class have. Do their parents or grandparents share the same features? Which features do you think might be influenced by our DNA and which ones are not?

Choosing who to select for your survey is called sampling. In your group, plan how you would carry out a bigger survey to get a more reliable result. You will need to decide how many people to ask and how you will choose them.

Discuss

Why do some people look alike and some people look different?

Do you share any features with members of your family, for example, the same hair colour or eye colour?

How reliable are your results? Are you confident that you'd get the same result if you asked more people?

Do you need to survey everyone? If not, how would you choose who to ask?

Do you think age, gender and ethnicity would affect your results?

Getting started

What features will you investigate in your survey?

I think the more people we ask the better our answer will be.

For the results to be reliable we'd need to ask everyone.

I think it is important to make sure you ask the same number of boys and girls.

Test your ideas

How will you record your findings? Could you make a table or a graph to show your results?

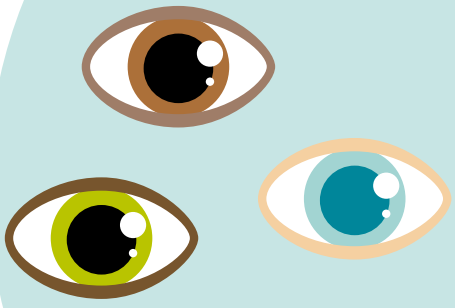
Maybe you could use a table like this one:

		Child	Mother	Father	Grandmother	Grandfather
Person 1	Eye colour	Blue	Brown	Blue	Blue	Brown
	Hair colour					
	Skin colour					
Person 2	Eye colour					
	Hair colour					
	Skin colour					

EXAMPLE

Share your ideas

Which features were most and least common in the class?
Did most people share their features with some family members?
Were there any features that were not shared with any family members?



Watch out!

Some people might not feel comfortable answering questions about their family and genetics. How would you make sure individuals can't be identified in the data you collect?

Extra things to do

Why not investigate other characteristics that are not visible. For example, some people taste broccoli differently to others, because of their DNA!

BRITISH SCIENCE ASSOCIATION

CREST AWARDS | SUPERSTAR

Peas in a pod

Organiser's Card

About the activity

This activity is designed to get children thinking about plant features and how these are influenced by genetics and the environment. Cosmic and Gem planted some seeds last week, and now the plants have started to grow. Even though they both planted the same seeds at the same time, the plants all look slightly different. Gem thinks the differences are genetic, but Cosmic thinks they are because of differences in the environment.

Through this activity you will support your group to:

- Design a test to grow seeds under different conditions
- Observe and record their results
- Present and compare their findings, discussing which differences were influenced by genetics and which by the environment

Kit list

- Fast growing seeds (peas are ideal)
- Seed trays
- Soil
- Water
- Labels
- Pens and paper

What to do

1. Introduce the activity using the story from the Activity Card. Ask the children if they have planted things before.
2. Give out the Activity Cards and poster making materials to the group.
3. Explain that they will be designing and conducting an experiment to find out if differences in plants can are genetic, environmental, or both. Discuss what types of differences they think they will see in their plants.
4. Support the children to design their experiments. Encourage children to discuss their ideas and how to carry out their investigations. Prompt questions:
   - What different environments can they put their plants in?
   - How many seeds will they plant in each set?
   - How will they measure and record their results? (There is a suggestion on the Activity Card)
   - How will they make sure their test is fair?

5. Support children to look after their plants consistently over the week.
6. After a week, support the children to record the different results, comparing the plants from the same environment and different environments.
7. Ask the children to present their findings to the rest of the group.

Things to think about

It's a good idea to write down the instructions for each set of plants so the children can remember how they decided to look after them during the week.

Keywords

- Genome
- DNA
- Variation

Extra things to do

Encourage children to investigate variation within species, by looking at plants that are from the same species, but have different characteristics. Try the below links:

- BBC: Artificial selection **bbc.co.uk/programmes/p02mtd91**
- AOL: Genetic variation **bsa.sc/common-vegetables**

Watch out!

Ensure children wash their hands after planting and handling seeds.

Consult CLEAPSS guidance on working outdoors at **cleapss.org.uk**

CREST AWARDS | SUPERSTAR

Peas in a pod

Activity Card

Cosmic and Gem planted some seeds last week, and now the plants have started to grow. Even though they both planted the same seeds at the same time, the plants all look slightly different.

Gem: "I think our plants look different because they have different genetics"

Cosmic: "I think they look different because we planted them in different environments and looked after them differently"

Your challenge

How will you test which differences are due to the environment and which are due to genetics?

How many sets of seeds will you plant? How will you look after the different sets?

What types of differences do you think you will see?

Discuss

How will you test which differences are due to the environment and which are due to genetics?

How many sets of seeds will you plant? How will you look after the different sets?

What types of differences do you think you will see?

Getting started

Think of some different instructions for your different seed sets, write down the instructions to help you remember!

Test your ideas

How will you record your findings? Could you make a table or a graph to show your results? How will you measure the differences you observe in the plants?

Maybe you could use tables like these ones:

Environment 1

	Seed 1	Seed 2	Seed 3	Seed 4
Leaf size				
Height				
Strength				

Environment 2

	Seed 1	Seed 2	Seed 3	Seed 4
Leaf size				
Height				
Strength				

Share your ideas

Tell the rest of the group about your results.

Do you think your experiment was fair? Could you do anything to improve it?

Extra things to do

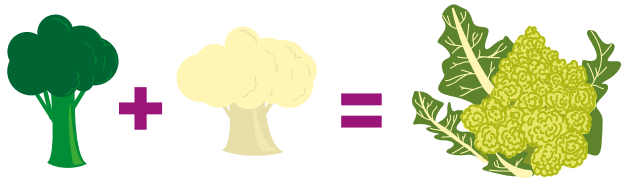
Look at plants or vegetables in the supermarket, for example tomatoes. How many types can you see? How are they different? How are they similar?

CREST AWARDS | SUPERSTAR

Plant parents

Organiser's Card

About the activity



This activity is designed to introduce children to selective breeding and genetic engineering in farming. Uncle Astro has a Broccoflower in the fridge - it's a mix between broccoli and cauliflower! He says it's a GMO - a genetically modified organism. Aunt Stella says that GMO foods come from plants that have had some genes added or removed to change the traits of the plant. Normally farmers use selective breeding or scientists use genetic modification to make fruits and vegetables that are bigger, tastier, or more resilient against pests. Selective breeding takes longer, but genetic modification is much more difficult. Cosmic thinks farmers could make all kinds of new food. What 'new' crop would you make?

Through this activity you will support your group to:

- Learn about selective breeding and genetic engineering in farming and some examples of how this is used
- Think about the traits of food producing plants and design their own 'new' crop, discussing whether this might be achieved by selective breeding or if it would need to be genetically engineered
- Prepare a poster advertising their 'new' crop and present it to the group

Kit list

- Poster making materials
- Access to internet (or printed materials about new genetically engineered crops)

What to do

1. Introduce the activity using the story from the Activity Card. Ask the group if they have heard of selective breeding or GMOs. Discuss what the two terms mean.
2. Give out the Activity Cards and poster making materials to the group.
3. Explain that they will be researching and making posters about a 'new' food crop.
4. Support the children to conduct their research and decide on their new crop.
5. Support the children to make their posters with information about their chosen new crop.
6. Ask the children to present their work to the rest of the group.

Things to think about

The UK has strict rules on GMO crops, so make it clear to children that they are not common in supermarkets. Try and pull out a discussion around the positives and negatives of GMOS. For example, 'Scuba' rice has been given beneficial qualities to ensure it can grow even during floods. This will help many people in the developing world. In contrast, many people are worried about the potential effects of GMOs.

Both genetic engineering and selective breeding are used to change a species, but the mechanism for change is different. Selective breeding selects for traits already present in a species, whereas genetic engineering creates new traits. GM crops have been very controversial.

Selective breeding is the process of selecting desirable characteristics of the parent. For example, replanting seeds from a crop that has shown to be particularly drought resistant. We have used selective breeding for thousands of years (for both plants and animals). However, it's limited to creating changes within species or very closely related species, and takes generations of selection.

GMOs are organisms that have had their characteristics changed through the modification of their DNA. One example is genes from a bacteria inserted into food crops so that the crop can create its own insecticide.

Try these resources to introduce your students to GMOs

- What is selective breeding? **yourgenome.org/facts/what-is-selective-breeding**
- What is a GMO? **yourgenome.org/facts/what-is-a-gmo**
- BBC: **Artificial selection bbc.co.uk/programmes/p02mtd91**

Keywords

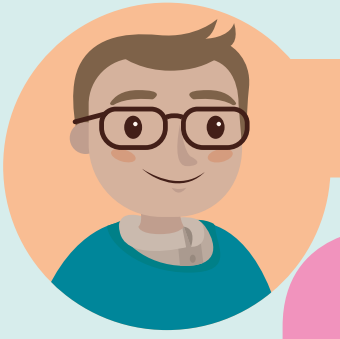
- GMO
- Selective breeding
- Genome
- Genetic modification

CREST AWARDS | SUPERSTAR

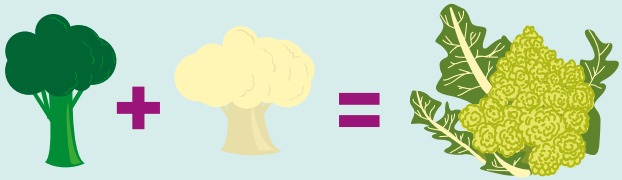
Plant parents
Activity Card

Uncle Astro has a broccoflower in the fridge - it's a mix between broccoli and cauliflower!

Uncle Astro



"It is a GMO - a genetically modified organism."



Stella

"GMO foods come from plants that have had some genes edited to change the traits of the plant. Normally farmers use selective breeding to make fruits and vegetables that are bigger, tastier, or more resilient against pests. Sometimes scientists use gene editing to make the crops better adapted for droughts or flood prone areas or resilient against pests. Selective breeding takes longer, but genetic modification is much more difficult."

Cosmic

"Wow, think of all the different foods you could make!"

Your challenge

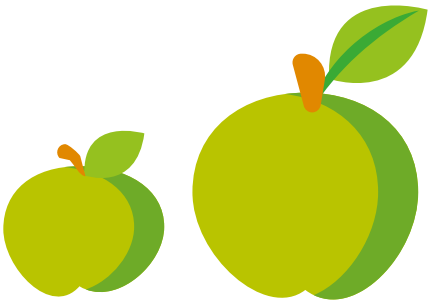
What 'new' crop would you make? Could you make it through selective breeding or would it need to be genetically modified? What would the benefits of your new crop be? Consider improving taste, appearance or health benefits.

Discuss

What traits would your 'new' crop have from the plants it was made from?

What do you think the positives and negatives are of genetically modifying plants? Can you think of concerns that people might have?

How could changing a plants' genes help people around the world?



Getting started

Think about some crops you would like to combine. Do research about the plants they grow on. What traits would you take from each plant?

What will you call your new crop?

Test your ideas

Are your two plants similar enough to use selective breeding? Or would you need to use genetic modification?

Share your ideas

Design a poster to encourage people to buy your new crop.

CREST AWARDS | SUPERSTAR

Sneeze zone

Organiser's Card

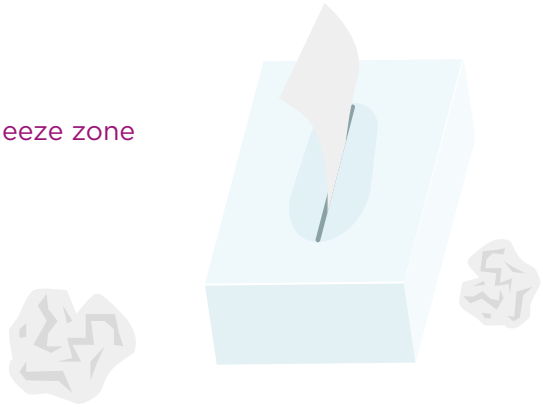
About the activity

This activity is designed to get children thinking about airborne infections. Cosmic has a cold. Gem thinks that he should cover his nose and mouth when he sneezes to stop other people catching it. Using water spray bottles, children will investigate the role of covering mouths and noses when sneezing and coughing to prevent the spread of airborne infections.

Through this activity you will support your group to:

- Learn about airborne infections
- Design and conduct a contamination experiment to find out if covering up a sneeze can reduce the spread of infections, testing different methods
- Record, evaluate and share their results

Kit list



- 10 sheets of flip chart (A1) paper stuck together to make the sneeze zone
- An empty and clean spray bottle
- Sticky tape
- Sugar paper cut into squares (7cm x 7cm)
- Tape measure (approx. 4 metres long)
- Three different coloured pens (red, blue and black)
- Tissues
- Water

What to do

1. (Pre-activity) Set up the 'Sneeze Zone': a 4m x 1.5m surface area, either on the floor or on a set of tables pushed together, by sticking together 10 pieces of A1 flip chart paper. Place a tape measure along one side of the mat and secure with sticky tape.
2. Introduce the activity using the story from the Activity Card. Ask the children if they think covering their face when they sneeze is important and why? Discuss how many diseases are airborne and can spread in tiny droplets of water or aerosols that people cough or sneeze into the air. Aerosols in a sneeze can travel at more than 100 kilometres per hour and cover a distance of more than four metres. Each droplet represents thousands of potentially harmful microbes that could cause infection.

3. Give out the Activity Cards and equipment from the kit list.
4. Explain that they will be designing and conducting an experiment to find out if covering a sneeze really reduces the spread of airborne infections, and which technique is most effective.
5. Everyone should draw a round face or a stick person on a sugar paper square. This represents a person. You will need between 10 and 30 of these. Place the "people" anywhere in the 'sneeze zone'.
6. First, complete an example scenario. Stand at one end of the sneeze zone and use the "nose" (water sprayer) to sneeze twice (spray the water). Measure how far the water droplets travelled using the ruler on the sneeze zone start mat. Count how many people on the mat were affected by the sneeze. Check each piece of sugar paper for any water marks. If there are any marks, draw a red circle around them.
7. Support the children to design their experiments. Encourage children to discuss their ideas and how to carry out their investigations. Prompt questions:
   - What different styles of sneeze covering could they test? How will they test them?
   - How will they measure and record their results? (There is a suggestion on the Activity Card)
   - How will they make sure their test is fair?
8. Support children to conduct their tests and make their own records of their results. (They could also take photographs or make drawings).
9. Ask the children to present their findings to the rest of the group.

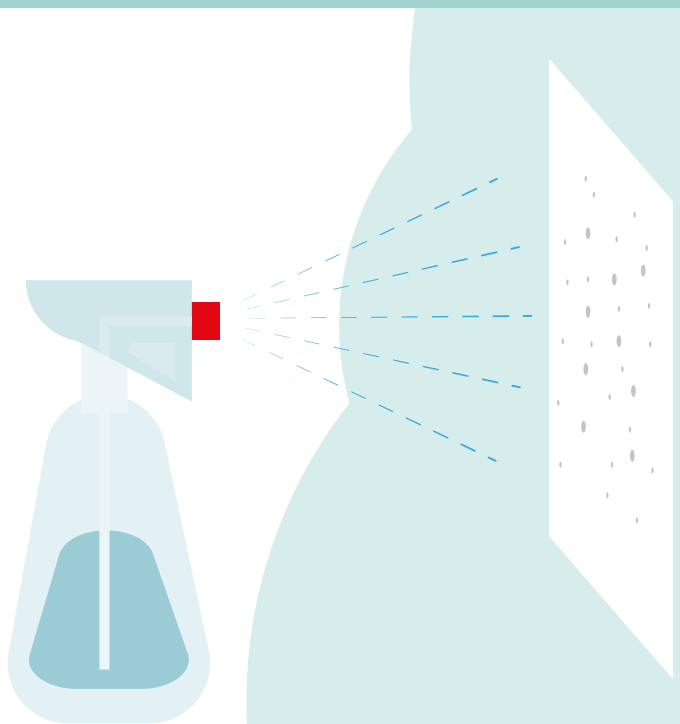
Things to think about

Additional sources of information on the web for teachers and students to increase their knowledge of pathogens:

- Wellcome Trust Big Picture: Influenza special issue **bigpictureeducation.com/influenza-special-issue**
- Wellcome Trust Big Picture: Epidemics **bigpictureeducation.com/epidemics**
- What are infectious diseases? **yourgenome.org/facts/what-are-infectious-diseases'**

Keywords

- Pathogens
- Aerosols
- Airborne
- Contamination
- Hygiene
- Prevention



BRITISH SCIENCE ASSOCIATION

CREST AWARDS | SUPERSTAR

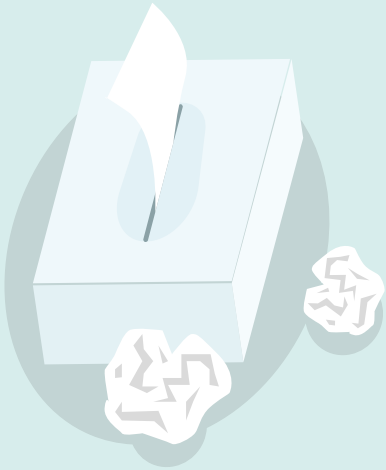
Sneeze zone
Activity Card

Cosmic has a cold.

Gem

"If you cover your nose and mouth when you sneeze or cough then other people are less likely to catch your cold. That's because when you sneeze you spray the microbes that are causing your cold!"

Is Gem right?



Your challenge

Can you help Cosmic and Gem? See if you can measure the distance and impact of a sneeze, simulated using water in a spray bottle to find out if covering your sneeze makes a difference.

Discuss

Do you cover your sneeze? If you do, do you cover your nose or your mouth?

How far do you think the tiny droplets from your sneeze can travel?

Getting started

How will you test your ideas to see which works best?

Test your ideas

How will you record your findings? Could you make a table or a graph to show your results?

Perhaps you could use a table like the one below:

Sneeze covering technique	Distance travelled by sneeze droplets
No covering	
Cover with hand	
Cover with tissue	

Share your ideas

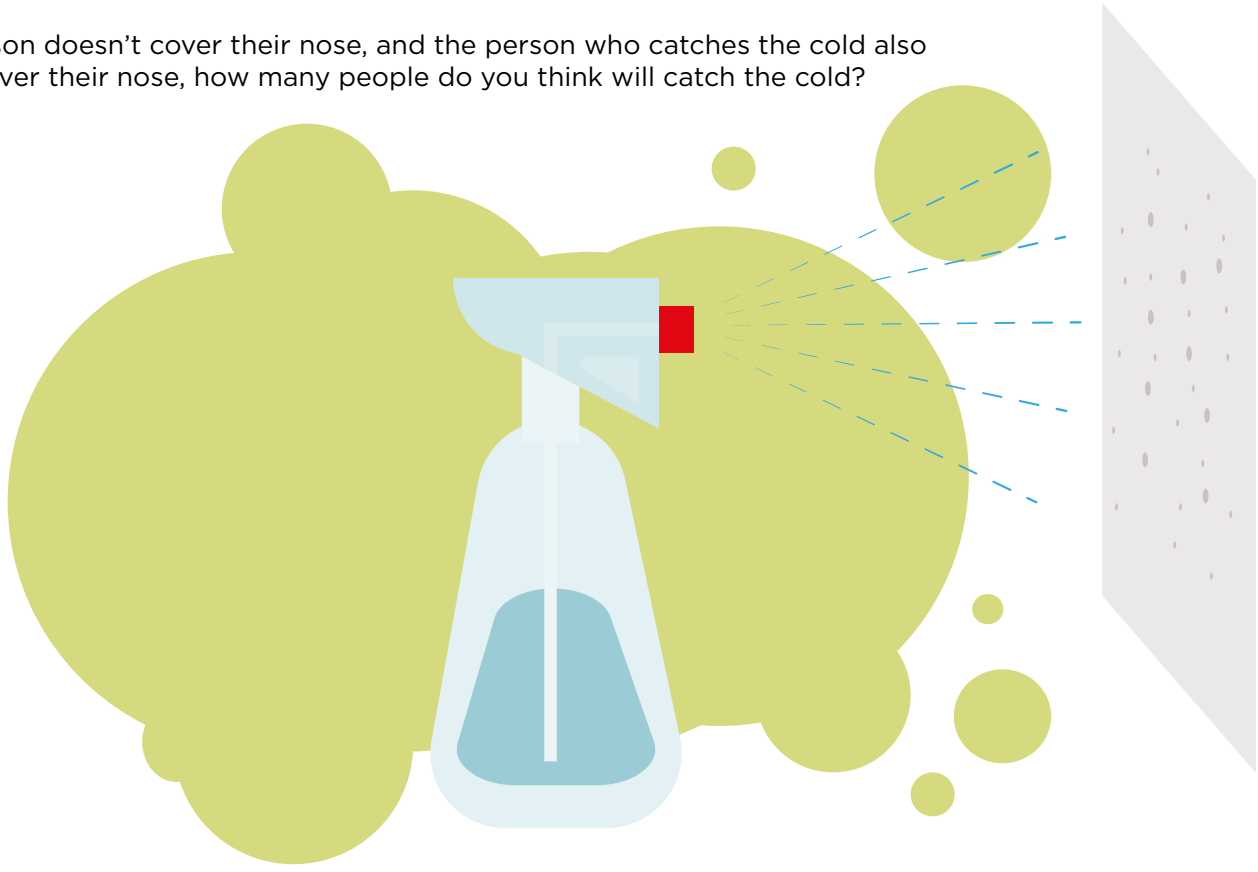
Tell the rest of the group about your results.

Do you think your experiment was fair? Could you do anything to improve it?

Will you change anything about the way you sneeze in the future?

Extra things to do

If one person doesn't cover their nose, and the person who catches the cold also doesn't cover their nose, how many people do you think will catch the cold?



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