

SECONDARY ACTIVITY PACK

Innovating for the future
5-14 March 2021
britishscienceweek.org

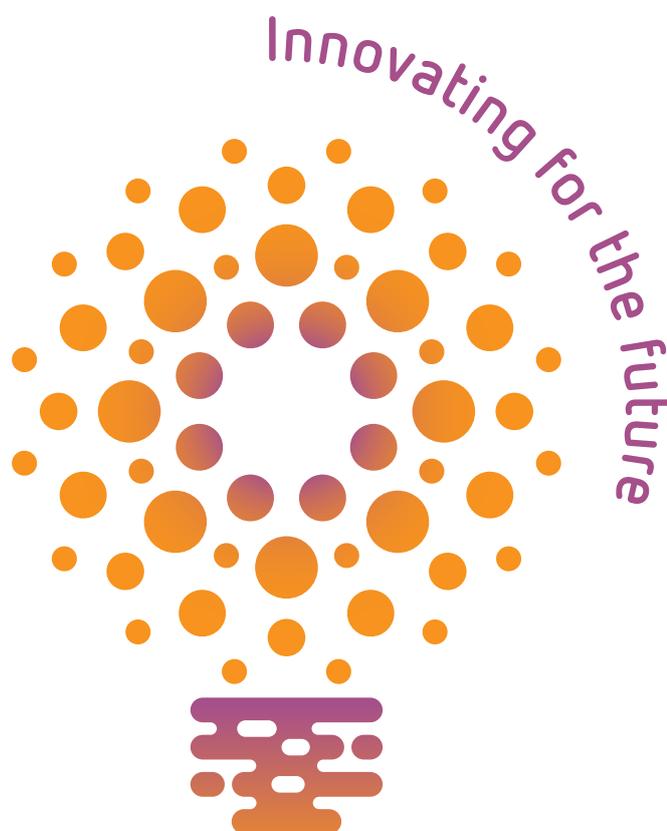
A range of activities
and ideas to be run with
students up to the age of 14

Delivered by

Major Partner: Innovation

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This activity pack is your 'one-stop-shop' for supporting you during British Science Week, but it can be used at any time. Feel free to adapt or extend the activities to suit your students' needs and the curriculum you are delivering.

In addition to the activities in this pack, there are lots of other ways to enthuse and engage your students throughout British Science Week.

In developing this pack, we have looked for activities which break down the stereotypes surrounding science, technology, engineering and maths (STEM) and that promote cross-curricular learning. We encourage you to use British Science Week as an opportunity to link STEM to other curriculum subjects and to your students' own backgrounds, lives and interests.

We understand that this academic year is quite different for schools and we've adapted this pack to best support you for British Science Week 2021.

This year, we've got some fantastic activities to complete in school, plus some specifically designed for students to take part in at home with their families.

Please feel free to further adapt activities within the pack to suit to your setting, taking into consideration any quarantine of resources, working in bubbles and social distancing needed.

We have also added in some suggestions on remote engagement if you are unable to accommodate visitors within your school.

Find an activity near you:

You can either create your own activity in your class, or see what activities are happening near you. Last year we reached more than 180,000 people. Help us make British Science Week 2021 even bigger and better! Visit [sciencelive.net](https://www.sciencelive.net)



Enter our competition:

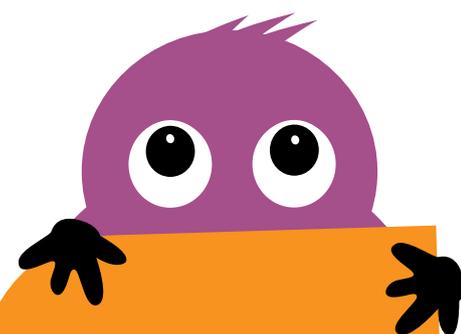
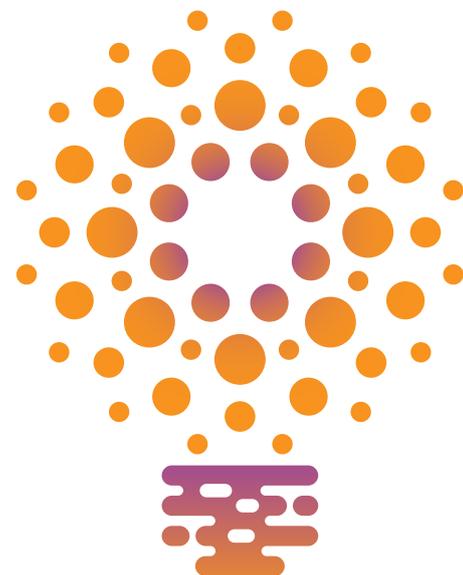
Some of the activities in this pack could be followed up by designing a poster; simply look out for the paintbrush symbol shown above. The theme for this year's poster competition is 'Innovating for the future'. For more information on the competition and how to enter, read on further in the activity pack or visit [britishscienceweek.org](https://www.britishscienceweek.org)

Introducing the theme	4
Making the most of volunteers	5
British Science Week at home	6
Gathering resources for your classroom or home	7
Beyond the week	8
Unlocking skills	9
Get students leading the way	10
Investigating Epsom Salts	11
Making hot ice	12
Conscious consumers	13
Build a working waterwheel	14
What is the best light colour for plant growth?	15
Action on biodiversity	16
Shaping the future	17
STEM Person of the Week	19
I'm a scientist	22
Planning for floods	23
Bringing data to life	25
Poster competition	27

Introducing the theme

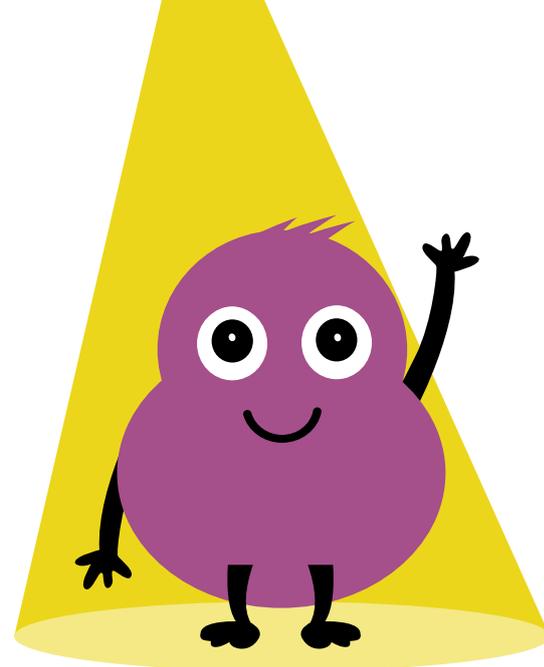
Why not start British Science Week off with a bang, by introducing parents and students to the theme 'Innovating for the future' in a fun way to get them excited about the Week ahead?

- ✓ Post your brilliant activity ideas or share images online tagging the British Science Association on Twitter - @ScienceWeekUK - and using the hashtag #BSW21
- ✓ Kick start the week with a simple but impressive demo. Try a game, an audio-visual presentation, a mystery or special object, an inventor's box or a pop-up display which communicates the theme 'Innovating for the future.' Here is a **video featuring the Rube Goldberg machine** which you can show the students. Anything that inspires their inquisitive minds is an epic start.
- ✓ Get the students to put on their thinking caps and experience innovation to experience innovation by asking them to come up with machines they would like to invent from readily available scrap or craft materials in the classroom or setting.
- ✓ Encourage the students to come up with an acrostic poem for INNOVATION by asking them what comes to mind when they hear it. You can even turn their acrostic poem into a jingle which you can sing with them throughout the week to remember their own ideas about innovation.
- ✓ Engage students into sharing how innovation is a part of people, materials, animals, nature or anything else in their everyday lives.
- ✓ Invite a special guest or someone from the school community to engage the children with their experience of an innovation. They could highlight a special tool that they use in their job and demonstrate how it makes their work more efficient, or they could feature their favourite innovation. **See Page 5** for information on how to get volunteers.



Here are some other ideas to start the week:

- ✓ Tell the students about the plan for British Science Week and give them a challenge related to the theme. If you are sending home a family experiment, maybe you could introduce / demo it at your setting first.
- ✓ Innovation is around us. Where has the topic of innovation been in the news or your local area? Can you give an example of innovation? Is there any way you can encourage conversations with students about this?
- ✓ Launch the poster competition and let parents know about this (see **Page 27** of this pack).



Making the most of volunteers

Opportunities for face-to-face engagement with external visitors may be limited this year, but there are opportunities for getting volunteers and presenters to engage your students online.

STEM Ambassadors offer their time and enthusiasm to help bring science and technology subjects to life and demonstrate the value of them in life and careers.

The STEM Ambassador website has recently been updated to enable teachers to request online STEM Ambassador support. Any activity created has an 'online' check box as well as a place to enter a link to a video conferencing call if required. STEM Ambassadors from across the UK can respond to any online activity request. Find out more and make a request here: stem.org.uk

You can also look for presenters and volunteers via Science Live (sciencelive.net) or ask parents if they work in STEM related jobs to describe what they do in more detail.

Things that work well are to:

- 1 Kick off British Science Week with a career talk/demo from one of these inspiring volunteers to engage the students for the rest of the week. The volunteer can highlight a useful tool or innovation which they use in their jobs and how it makes their job easier. Or, the volunteer can highlight their favourite innovation to share what and why that is.
- 2 Schedule two or three different guests for a career talk throughout the week if you can. This will keep children excited and anticipating who the next guest will be, and what they do. Opportunities like this will likely inspire them about what they want to be in the future. Remember, they are never too young to explore their career options.
- 3 Where available, choose volunteers/ambassadors who challenge stereotypes the students might have and promote positive

attitudes towards science - e.g. female engineers. Let the volunteers/ambassadors share in a simplified talk how their job is making a difference in the world (or an anecdote of what science activity they loved to do as a child).

- 4 Book your visitors early (many speakers get booked up during Science Week), have a clear idea of what you want them to do and communicate this with them ahead of time.

Volunteers come from a range of careers and experiences, from engineers, designers and architects to scientists and technicians, so get children excited about inspirational career talks, broaden choices and develop their interest in these careers!

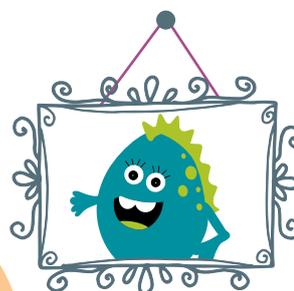
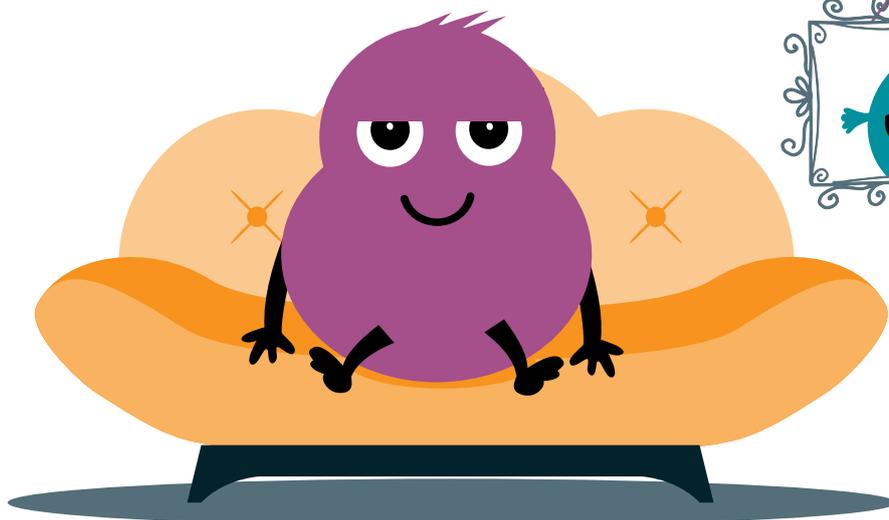
Visit [Inspiring the Future's](http://inspiringthefuture.org) website for some helpful ideas for using volunteers, some of which may be transferable when using remote engagement.

inspiringthefuture.org

British Science Week at home

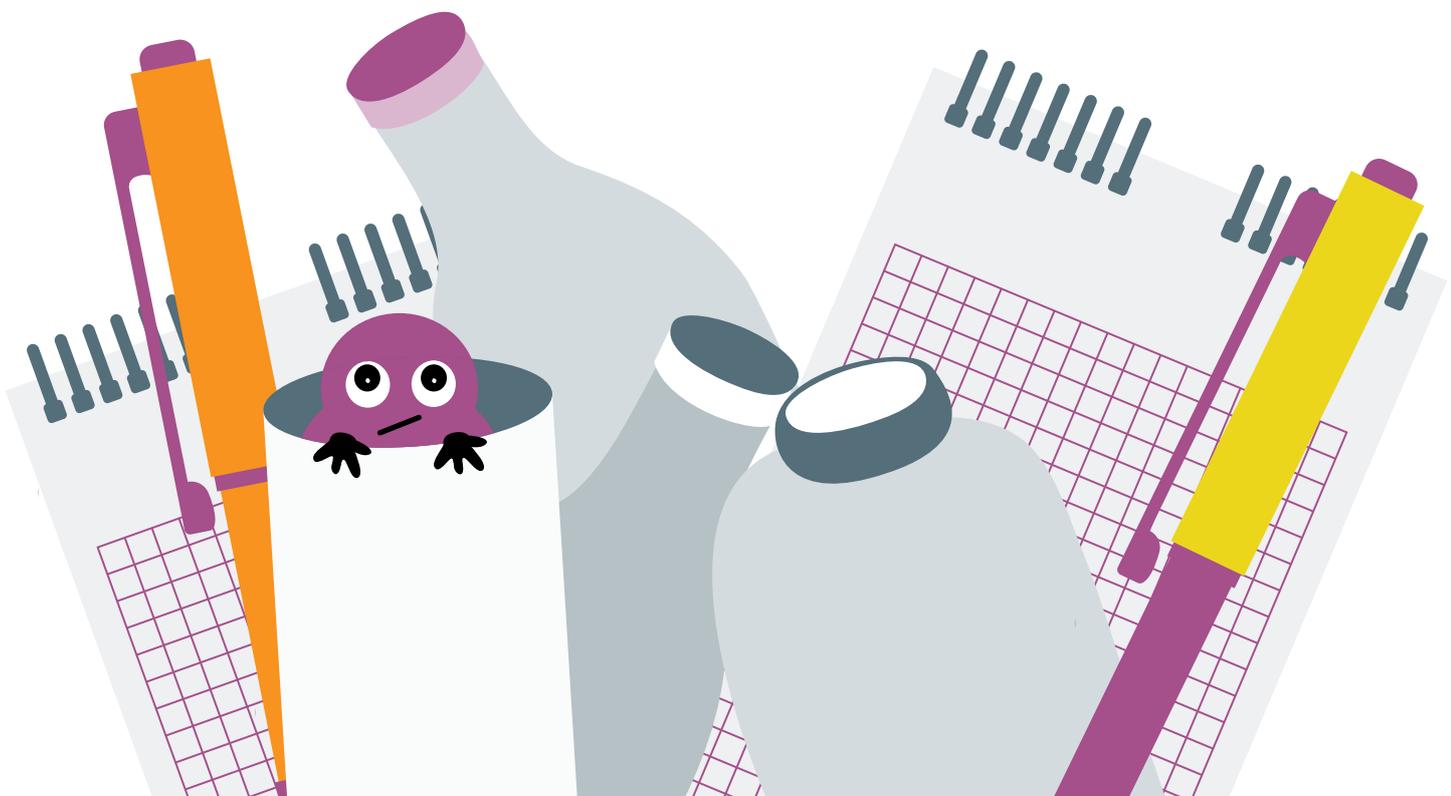
Want your students to enjoy British Science Week at home, but not sure how? Here are our top tips for engaging parents and carers in the Week:

- 1 Make the most of your parent newsletters, the Parent-Teacher Association (PTA), chat group and text messaging services, if you have them. Let parents know in advance of the Week (at least a month before) what you have planned and how you'd like them to be involved. They might be able to collect/donate materials and store them for use during the Week; and if you want them to get involved in any experiments at home, they may need time to plan and collect materials themselves. The PTA may be able to support you financially to run the Week or help drum up parent volunteers.
- 2 Get parents thinking about how their own jobs might link to STEM subjects and encourage them to chat with their children about this. You could do this via a newsletter or send students home with activities they can do with their parents, which may then lead onto further conversations. (See Page 12 for a great take-home activity.)
- 3 Encourage exploring outdoors, in the community or in local cultural spots. This could be anything from going on a nature walk around local parks to spotting STEM in action on the streets around students' houses. Why not try out some of the CREST Award activities which are quick and easy to do as fun, outdoor challenges too: library.crestawards.org
- 4 Send an experiment idea home during the Week which may spark mealtime discussions around STEM. Try and make it as low-resource as possible. It can help if it's something the students have tried or seen at school first, so they feel like 'experts' when they do it at home with family, allowing them to lead the learning. Explore your options for fun science-based activities at home which require few resources from the CREST at home collection collectionslibrary.crestawards.org



Gathering resources for your classroom or home

- ✓ If you can, try to collect materials all year round that can be cleaned and stored for use during British Science Week.
- ✓ Alternatively, check whether there is a scrap shop/store/club open in your local area. These shops are often membership-based and can be a brilliant, inexpensive or free resource for card, plastic, bits of material – all sorts. These things can be turned into rockets, cars, spaceships; you name it, the kids will think of it!
- ✓ Look at childrensscrapstore.co.uk to find a UK directory of scrap stores.
- ✓ Take photographs when out and about and share these with the students to foster discussion and raise their level of understanding about innovation – machines, materials, building structures, etc.
- ✓ Collect story books and reference books linking to the theme 'Innovating for the future' ahead of time to create a themed library.





Beyond the Week

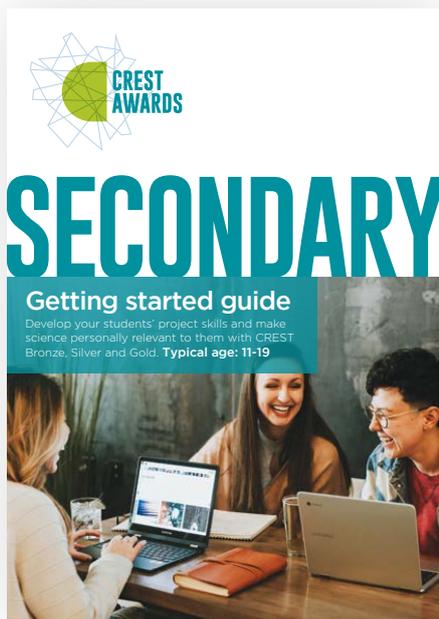
Once British Science Week is over, this doesn't mean the exploration and curiosity have to stop!

Some ideas for keeping children engaged include:

- ✓ Students could take part in a CREST Award, spending anywhere between 5 and 70 hours of work on a project that they lead on, or a topic that they're interested in, to achieve a Bronze, Silver or Gold Award. Find out more and how your students can get involved: secondarylibrary.crestawards.org

- ✓ Consider sharing your British Science Week learnings by running a CPD session for other teachers in your school or, where relevant, academy chain. Think about incorporating the Science Capital teaching approach into your methods: ucl.ac.uk. If you have the opportunity, then you could consider running a STEM club or curiosity lab within science class or school.

- ✓ Find supporting resources at stem.org.uk.



Unlocking skills

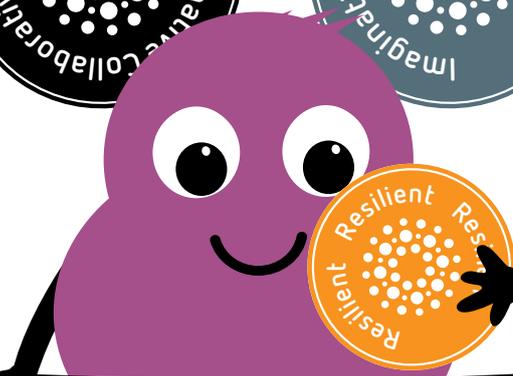
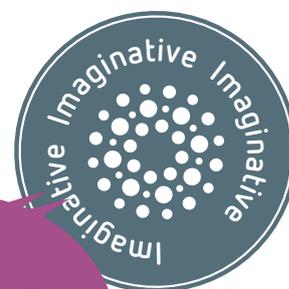
A fantastic way to encourage STEM interest in pupils is to introduce transferable skills used by those working in STEM jobs. These skills will strengthen positive attitudes towards STEM and reduce their stereotypes of those working in the field.

You could engage the pupils in this STEM Person of the Week activity from NUSTEM at Northumbria University (nustem.uk).

Ask the pupils to identify what attributes people working in STEM need. It might include being observant, creative, patient, a good communicator, or curious.

See the table below for the complete list developed by NUSTEM.

As an alternative and a little bit of motivation, why not award each of the pupils with a sticker or certificate for a STEM skill which they identify with very well during the Week?



Observant	Open-minded	Committed	Tenacious
Creative	Imaginative	Patient	Collaborative
Resilient	Communicator	Passionate	Organised
Curious	Self-motivated	Hard-working	Logical

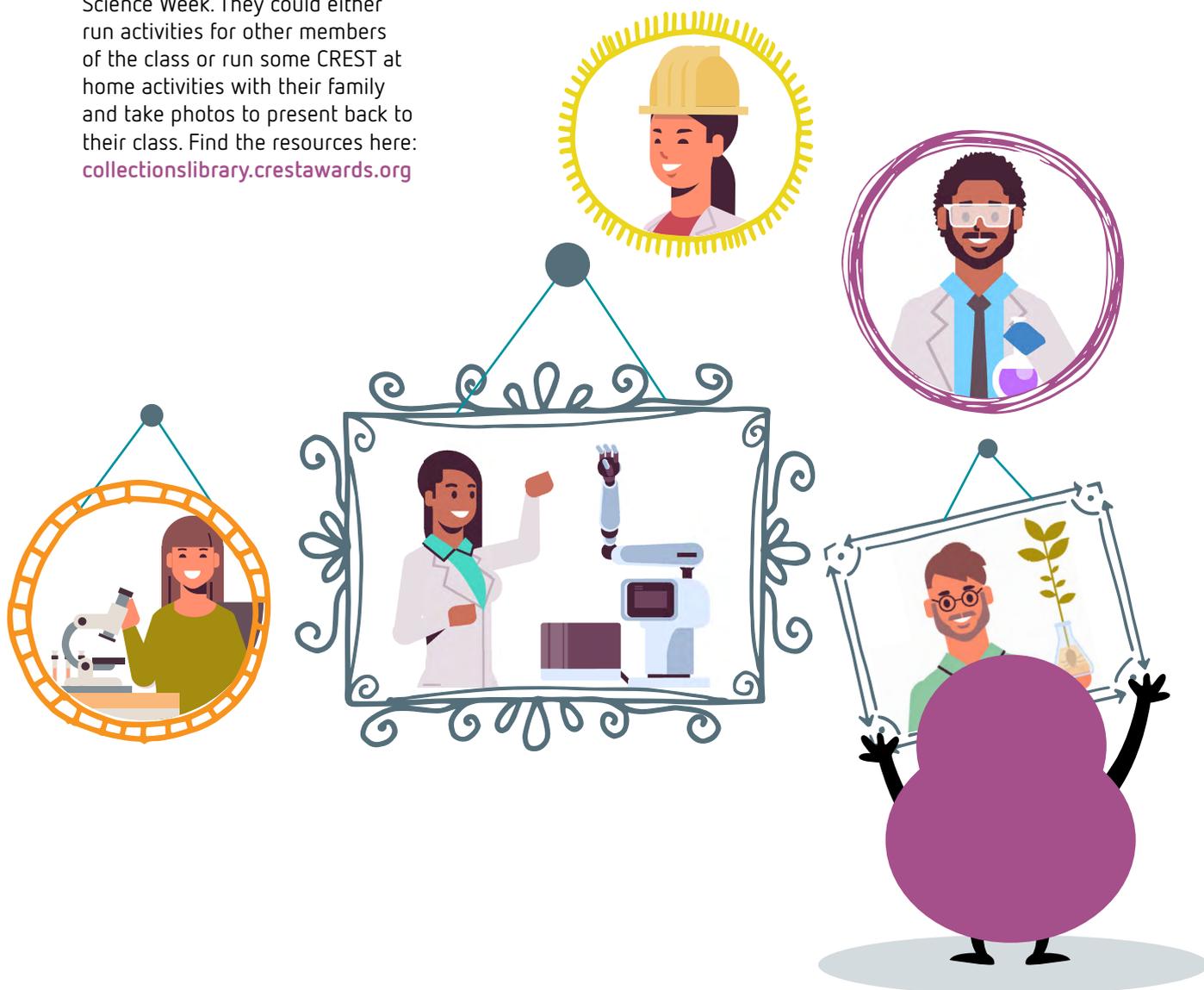
Get students leading the way

A great way to encourage STEM interest in students is by letting them lead the way. Here's how you can help them along:

- ✓ Encourage students to run their own activities during British Science Week. They could either run activities for other members of the class or run some CREST at home activities with their family and take photos to present back to their class. Find the resources here: collectionslibrary.crestawards.org

- ✓ Ask students to research an invention and how this influenced our lives today and then write a report for the school newsletter or website.

- ✓ Encourage students to design and create their own display of scientists through time – a photo exhibit of scientists who changed the world with their discoveries, inventions and innovations.



Innovating for the future

Investigating Epsom Salts

About this activity

An important skill for scientists is to be able to investigate claims. As consumers, we need to be able to find out if the things manufacturers claim about a product are true. In this activity you are going to investigate Epsom salts, which are often sold as a cure for stress and sore muscles.

Time

Setting up the experiment will take around 20 minutes. You then need to leave it overnight and check back on it over the next few days.

Kit list

- ✓ Epsom salts
- ✓ Measuring cylinders
- ✓ Test tubes
- ✓ Sand
- ✓ Beakers
- ✓ Spatulas
- ✓ Hand lenses

Next steps

Practical investigations are a key part of science. They help you to develop a range of skills and to understand how ideas can be used to explore the world and improve our quality of life. Practical work is a strong component of the Collins Science materials – check out our KS3 and GCSE Practical Lab Books.

Watch out!

Magnesium sulphate is safe to handle and is not poisonous unless taken to excess. In fact, it is sometimes used as a laxative. However, you still should not taste it, and make sure you check out the CLEAPSS guidance before using.

Instructions

You will be investigating Epsom salts; the chemical name for this compound is magnesium sulphate.

- ✓ Which three elements are present in magnesium sulphate?
- ✓ Examine a sample using a hand lens and describe it.
- ✓ Magnesium is an essential element in the human body. Research why our bodies need magnesium.

Some materials are soluble in water and others aren't.

- ✓ Try dissolving a spatula of Epsom salts in one third of a test tube of water. Shake well; is it soluble?

Now it's time to try and grow crystals.

- ✓ Measure out 200ml of Epsom salts into a beaker and add an equal volume of hot, but not boiling, water.
- ✓ Stir well to completely dissolve the solid, then drop in a few grains of clean sand to give the crystals something to grow on.
- ✓ For best results, the beaker should go in a freezer for 10 minutes and then into a fridge, but if you can't use a freezer, it should still work.
- ✓ Keep in the fridge overnight or (preferably) longer.
- ✓ Pour off the water and examine with a hand lens.

Although magnesium is essential for the body, there is no conclusive evidence to suggest it can be absorbed through the skin.

- ✓ How would you respond to an advert claiming that bathing in Epsom salts is a good way of avoiding magnesium deficiency?

At home

A common use for Epsom salts is dissolving them in water to create a relaxing bath. See if you can get members of your family to volunteer to try this out and report back on whether it works for them. Do they experience any benefits and, if so, what?

Skills set

Observant, Logical, Curious

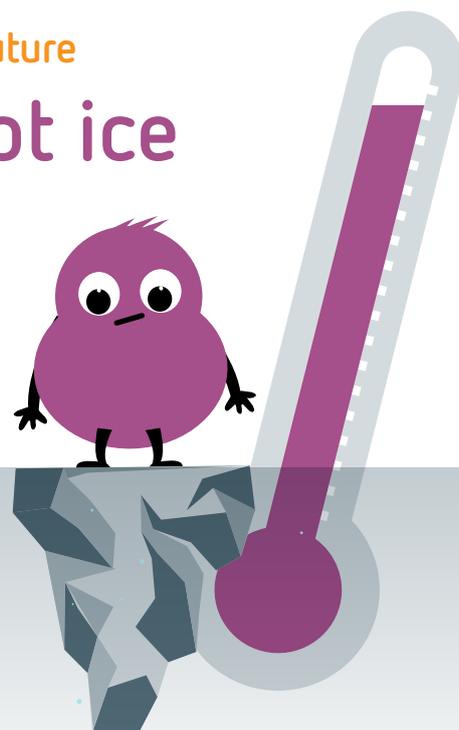
Career options

Laboratory technicians use skills such as making up solutions and growing crystals. Other scientists such as chemists working in the food or pharmaceutical industries may be involved with testing products and investigating claims. Some scientists work for newspapers and journals to report on products and offer opinions about their value.



Innovating for the future

Making hot ice



About this activity

In this experiment you will try to create a substance that is liquid at room temperature but when disturbed immediately crystallises to form something known as 'hot ice'. Hot ice is an amazingly cool substance and the ingredients are easy to find. However, it is tricky to make, so it may take you a few attempts to get it right!

Time

1-2 hours

Kit list

- ✓ 1 litre clear (not malt) vinegar
- ✓ 4 tbsp baking soda (sodium bicarbonate)
- ✓ Steel saucepan
- ✓ Plastic container

Next steps

How It Works is the action-packed magazine that's bursting with the answers to your curious questions - every issue is jam-packed with the most exciting advances in science and technology and features everything you need to know about how the world around you - and the universe - works. **Exclusive offer for schools and students!** Get *How It Works* for 6 months for £9.99 plus other great offers over at: magazinesdirect.com/bsw2021 or telephone 0330 333 1113. Please use code: 89AA. Offer ends 30 September 2021.

Watch out!

This experiment should only be performed under adult supervision. The saucepan and liquid will be very hot and extreme care must be taken. Do not cover your liquid when it is still boiling, as the pressure may cause the container to explode. While this form of hot ice is non-toxic, it should not be consumed.

Instructions

Measure 1 litre of clear vinegar and **slowly** add 3-4 tablespoons of baking soda. Stir until it is dissolved and then put the mixture on the heat to boil.

- 1 Leave to boil for 30 minutes. You'll start to notice a white substance on the side of the pan. This is sodium acetate, save a bit of this to use later.
- 2 When you see a crust (sodium acetate anhydrous) begin to form, take the liquid off the heat and transfer it to a container. Cover the container to prevent the substance crystallising, then cool it in an ice bath for 15 minutes, or a fridge for a bit longer.
- 3 The liquid needs to cool below room temperature to become a supercool liquid. Once it has cooled, take the lid off and add some of the white sodium acetate you collected earlier.
- 4 As the sodium acetate is introduced, the liquid will begin to crystallise and after a few seconds the entire liquid will 'freeze'. However, if you

touch it, the substance will feel hot not cold, because the process of crystallisation is exothermic. That means that heat is given off, so the liquid turns into a solid.

Most substances have a freezing point, where the molecules rearrange from a liquid into a solid or crystal arrangement. Sodium acetate trihydrate, or hot ice, is a supercool liquid, which means even though it's a liquid at room temperature, the molecules will rearrange into solid form when disturbed (by adding sodium acetate).

Skills set

Observant, Patient, Curious

Career options

If you're interested in chemical reactions, you can spark change by working in the lab as a chemist or at a power plant, where you'll be dealing with the management of substances - some of which are useful for improving our lives. You could even become a chemistry teacher, educating the next generation and carry out this experiment with your class.

Here's the reaction for this experiment and a bit about what's happening:



Innovating for the future

Conscious consumers

About this activity

Are you a conscious consumer? Our gut microbes help us to digest our food, but they also support our immune system, and potentially support our mental health too. So, does your lunch benefit your gut health or is it just convenient? In this activity you will create a delicious probiotic-filled dish at home that also fuels your gut microbiome!

Time

30 minutes to prepare
At least 3 days for fermentation

Kit list

- ✓ Cheese grater
- ✓ Sealable jar container
- ✓ Small red/green cabbage
- ✓ 1 ½ - 2 tsp salt
- ✓ 3 tbsp fresh ginger
- ✓ 3 tbsp fresh turmeric
- ✓ 4 cloves of garlic
- ✓ 3 carrots
- ✓ 1 beetroot

Next steps

Visit our website to learn more about how your consumption choices affect your gut microbiome by completing the rest of the 'personalised nutrition' activities. You can also explore the other topics 'food miles' and 'plant-based diets' to find how much of a conscious consumer you really are: discoverytrust.org.uk



PERSONALISED
NUTRITION



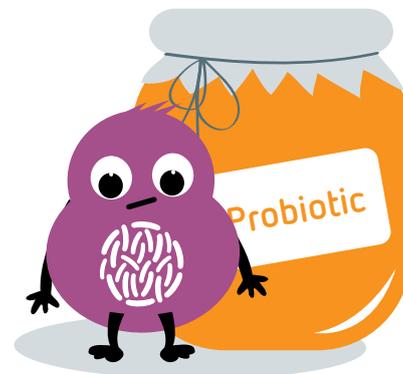
FOOD MILES



PLANT BASED DIETS

Instructions

- 1 Sterilise your container with boiling water. Wash your hands thoroughly before handling food.
- 2 Grate the cabbage, carrots, beetroot, ginger, garlic, and turmeric and set aside.
- 3 Put cabbage and salt into a bowl and massage thoroughly for 10 minutes. The cabbage will start to soften and release water. After 10 minutes, add the carrots and beetroot and continue to massage for another 5 minutes.
- 4 Add garlic, turmeric and ginger to taste and mix well.
- 5 Use clean hands to place your mixture into your sterilised container(s) and seal. The liquid produced from massaging should rise above the vegetables in the container, if it doesn't, add some filtered water to top it up. Make sure you leave an inch between the contents and the lid, so it has room to expand.
- 6 Now, let it ferment! Optimal temperature for fermentation is above 18°C so keep your jar somewhere warm and dark to help it ferment quicker.



Fermentation can occur within 3 days, but it might take longer. Open your container daily to release CO₂ produced during fermentation and push the vegetables back below the liquid.

The longer it sits and ferments the tangier it will become! Once you decide it is fermented to your taste, you can store it in the fridge, but make sure you eat it within 3 months.

At home

Can you design a microbe boosting lunch? Think about what varieties of food you might use and whether they contain probiotics and prebiotics.

Skills set

Open-minded, Creative, Self-motivated

Career options

Scientific research is helping us understand which foods have positive or negative effects on our gut microbiome and allowing us to develop new diet-based therapies to promote health and treat disease. Innovations in agriculture are enabling us to feed a growing population in increasingly environmentally friendly ways.

The Conscious Consumers project was designed for the Food and Farming Discovery Trust by: **The SAW Trust, LEAF Education, and Youth STEMM Award.**

The Conscious Consumers project was funded by: **Chadacre Agricultural Trust**

Watch out!

You are making a food product so make sure you are working with clean equipment, clean surface and clean hands. Wash your hands thoroughly before starting this activity. Seek adult supervision when cutting up the ingredients if needed.

It is important to sterilise the container to allow for proper fermentation, you should ask for adult supervision whilst sterilising using boiling water.

Innovating for the future

Build a working waterwheel

About this activity

In this activity you're going to be building a waterwheel (which could be used to generate renewable electricity). You can experiment with dropping water from a greater height or with greater force to see if it affects how quickly the wheel moves.

Historically waterwheels have been used to power machinery in Victorian mills but today they can be used to generate sustainable electricity.

Time

1 hour

Kit list

- ✓ Thick card or plasticard (for a more durable waterwheel).
- ✓ Pen/pencil
- ✓ Plate (to use as a template)
- ✓ Wooden doweling (or round pencil)
- ✓ Disposable cups
- ✓ Scissors
- ✓ Adhesive
- ✓ Bottle/watering can/hosepipe or dried beans
- ✓ Bucket/washing up bowl (or do this outside!)

Next steps

- ✓ Go to MyLearning (mylearning.org) and type 'waterwheel' in the search bar to learn more about the history of waterwheels and how they have been used in the past as well as how we can harness water for renewable energy into the future!

Watch out!

When cutting and attaching be careful not to cut yourself.

You might get wet! Quickly mop up any spills or the floor will get dangerously slippery.

Instructions

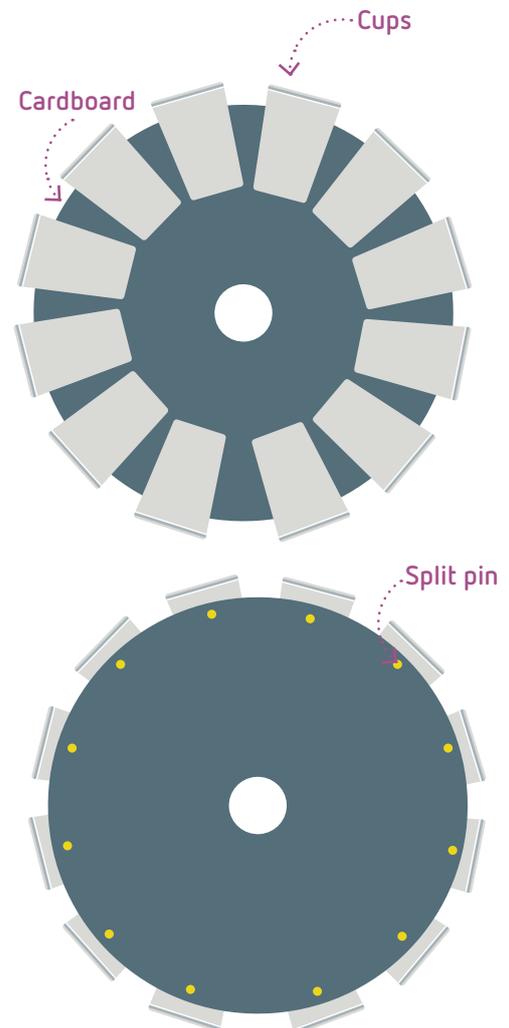
- 1 Use a circular template (such as a plate) and draw two big circles on the plasticard/thick cardboard, then cut out the circles to form the sides of your wheel
- 2 Mark the centre of the circles and cut a hole in the middle of each of them. The hole in the centre should be wide enough to fit the axel (doweling or pencil). Then use split pins or tape to attach plastic cups to the edge of the wheel (it will work best if you use at least 4 cups). Make sure the cups are positioned at around a 45 degree angle to the edge of the wheel.
- 3 Once you've built the wheel, push the doweling or circular pencil through the holes in the middle of the wheel, and mark a point on the wheel so you can count its rotations.
- 4 Now it's time to test! Hold the water wheel above the bucket or bowl, and pour water into the waterwheel from above to make it turn (you could also pour dried beans from a bottle instead of water)
- 5 Try pouring water from different heights to see if the speed of the wheel changes or try increasing the stream of water and observe whether the wheel speeds up.

At home

How is the electricity you use at home generated? Can you think of any alternative sources that homes could get their energy from in the future that would make for a more sustainable planet? How might these work?

Skills set

Creative, Observant, Curious



Career options

There are many different career options within museums and historic sites, including engineers, maintenance (historical preservation), joiners, and many more.

Example table of results (scientific investigation)

Height water poured from	Number of wheel rotations in 30 seconds
1cm	
10cm	
20cm	

What is the best light colour for plant growth?

About this activity

Increasing crop production is vitally important as the world population increases. Growing food in greenhouses using artificial light contributes to improved food security in Britain and the rest of the world because it extends the growing period of plants. This activity challenges you to plan and investigate the effect of different colours of artificial light on pea plant growth.

Time

1 hour

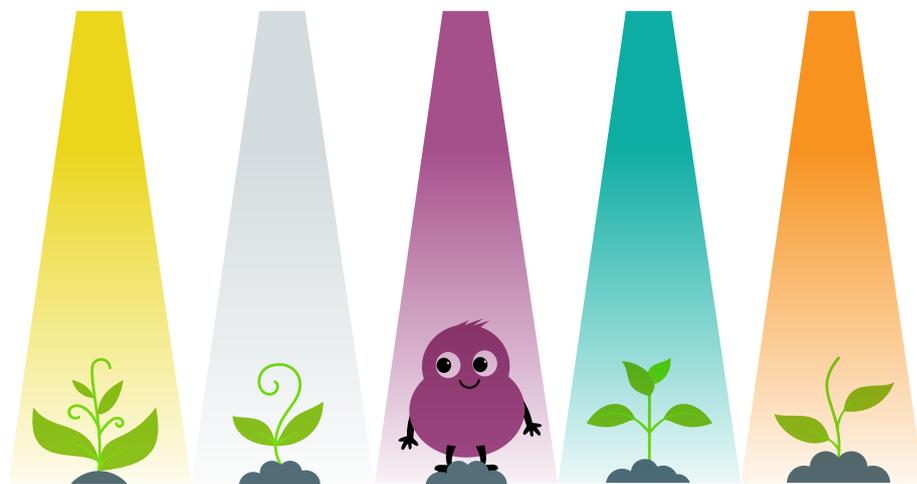
Kit list

- ✓ Pea seeds (preferably pre-soaked and starting to germinate)
- ✓ Potting compost
- ✓ Seed trays, plant pots or cream pots
- ✓ Several similar boxes with removable lids e.g. photocopier paper boxes
- ✓ Different coloured filters (red, green, blue, yellow, cyan, magenta and colourless are suggested) or different coloured LED bulbs
- ✓ Measuring cylinders/beakers
- ✓ 30 cm rulers
- ✓ Balance scales (to 0.1 g or 0.01 g precision)

Next steps

Now that you have started thinking about maximising crop production, why not find out about other ways that farmers are working to feed an ever-increasing population whilst caring for the environment?

You can enter our competition, take a virtual tour of a farm, and access more exciting investigations like this one at www.farmvention.com. Submit your ideas to be in with the chance of presenting your project in Parliament!



Instructions

- 1 The global population is rising quickly and so it is essential to also increase global food production. Greenhouses offer a good solution for extending the growing season by providing plants with a warmer environment, one that is sheltered from the wind and has better light from artificial sources.
- 2 Which colours of light do you think are the most important for growing plants? Your challenge is to find out which colour light will help pea plants grow most successfully.
- 3 Plan your investigation. Think about what your independent and dependant variables will be. Which variables will you need to control?
- 4 You might like to grow your pea plants in different cardboard boxes, cutting holes in the top of the boxes, watering and shining a light onto the pea plants through

different coloured filters. Then you could measure the growth of the pea plants either by weighing them or measuring their height.

- 5 Growing more than one pea plant in each box will help you to improve the reliability of your results.
- 6 Carry out your investigation and write a scientific report. As part of your conclusion, make a recommendation to British farmers based on the evidence you have collected about the best colour light for growing plants in a greenhouse.

At home

Why not repeat the experiment with other vegetable plants and see whether the results are the same? Do different plants react differently to light colours?

Skills set

Observant, Patient, Logical.

Career options:

The diverse and rapidly changing world of food and farming has thousands of fantastic STEM career opportunities. Whether you are interested in robotics, animal welfare, engineering, horticulture, business or food technology, there is a career for you. Visit fginsight.com/thisisagriculture to find out more.

Watch out!

Spills should be cleared up immediately and you should wash your hands after handling compost. Lamps will become hot so take care to avoid burns. Water should be kept away from sources of electricity.

Innovating for the future

Action on biodiversity

About this activity

You will gain practical skills through the challenge of monitoring biodiversity in your local area, and planning action to make improvements for the benefit of nature and people. This includes collecting and analysing data to identify trends and key findings, followed by writing up a report to communicate your discoveries.

Kit list

- ✓ Computer to access the following resources via www.wwf.org.uk/scienceweek2021
 - The Living Planet Report – Youth Edition
 - Our Planet Lab
 - *Seek* by *iNaturalist* App
- ✓ Access to What is Biodiversity? video www.youtube.com
- ✓ Access to What is Biodiversity? poster www.wwf.org.uk

Next steps

Seek by *iNaturalist* App

The free *Seek* app allows real-time identification of organisms through live image recognition when a plant, animal or fungus is scanned with the camera of a tablet or phone. As well as helping identify species, it provides a practical introduction to taxonomy and provides information about the species identified, helping to build understanding of the interconnected ecosystem explored through the activity. If connected to a free *iNaturalist* account (which can be set up through the app by anyone over 13) observations can be submitted to a global database, helping scientists monitor global biodiversity.

Our Planet LAB Toolkit

The Our Planet LAB Toolkit outlines the steps that a class or group can take to monitor, study and improve local biodiversity. It contains a wealth of digital and offline tools and techniques including mapping grids, observation sheets, biodiversity tracking worksheets and more.

Instructions

- 1 Learn about biodiversity, what it means and why it is important by watching the *What is Biodiversity?* video and reading the biodiversity explainer poster.
- 2 Read the *WWF Living Planet Report (Youth Edition)* and consider how wildlife population data is collected and analysed.
- 3 Organise and run a bioblitz activity to take a biodiversity snapshot of your school grounds or chosen habitat. Collect biodiversity data using the *Seek* app and/or *Our Planet Lab toolkit*.
- 4 Analyse the data to draw out key findings.
 - ✓ How can the data be segmented? I.e. the number of observations or the number of different species per habitat type
 - ✓ How do habitats vary and how does this influence what is found there?
 - ✓ How might human activity affect future results in a positive and/or negative way?
- 5 Report your findings and make recommendations on improvements that could be made to the habitat to encourage an increase in biodiversity.
 - ✓ Why is biodiversity important to the local area?
 - ✓ What are the key findings and recommendations?
 - ✓ How can you create a report that is scientifically accurate but also engaging to an audience?

At home

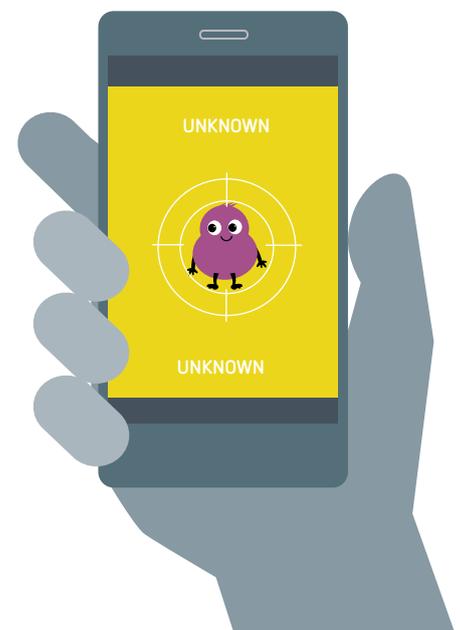
- ✓ After assessing the level of biodiversity in your chosen area, create an action plan to improve it.
- ✓ Consider the meaning of the term 'citizen science' and learn about its importance in helping scientists identify problems, understand them and then find solutions.
- ✓ Use the free *Seek* app to identify your wildlife finds, and record and submit your bioblitz data to *iNaturalist*.
- ✓ Learn more about biodiversity and different habitats through WWF-UKs Learn to Love Nature programme: www.wwf.org.uk.

Skills set

Observant, Committed, Organised

Career options

Biodiversity and Ecology Officers conduct field surveys and write reports and recommendation on habitat management and the impact of human activity on ecosystems. Data Scientist responsibilities include data integration, spatial data analysis and developing statistical techniques. Other careers include Research Assistants.



Innovating for the future

Shaping the future

About this activity

In this activity you will learn about and consider the role of biomes in the overall 'living system' of our planet, research the causes of problems threatening these biomes, and then research and develop your own innovative solutions for a positive future.

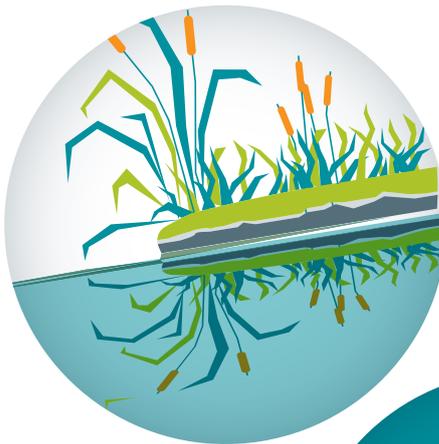
Kit list

Access to a computer for the following resources via

wwf.org.uk/scienceweek2021

- ✓ The Living Planet Report – Youth Edition
- ✓ Living Planet Report educator pack
- ✓ Future Visions of Our Planet film (4 mins)
- ✓ Our Planet Biomes Binder (pdf)
- ✓ Our Planet Explorable Globe
- ✓ Our Planet & World Economic Forum 'Pioneers for Our Planet' videos

Additional worksheets
on page 18



Instructions

- 1 Working in small groups or individually, research the challenges facing one of the six biomes featured in the Our Planet Biomes Binder (**grasslands, freshwater, forests, seas, jungles, or frozen worlds**).
- 2 Use the Our Planet Explorable Globe to find videos and animations that bring the key subjects to life.
- 3 Consider the human activities that are causing the biome to be damaged or threatened, and come up with ideas for new technologies or techniques that could meet human needs without causing the same problems. You can browse the Pioneers for Our Planet videos for inspiration.

- 4 Present your idea using the worksheet provided, explaining how it would work and the positive effect it would have on the planet. Share and discuss your ideas with other groups and decide which ones could be the most effective.

Skills set

Communicator, Open-minded, Hard-working

Career options

There are many different career paths you can take that can help shape the future of our planet, from scientists and research specialists to government policy makers and technological innovators.

Solve the problems of today for a brighter future!

Consider possible approaches that might stop the biome being harmed. Try to come up with at least one for each category:

- ✓ **Technology** What new invention might allow us to carry out the activity without causing harm to the biome?
- ✓ **Education** Who could help solve the problem if they behaved differently?
- ✓ **Policy** What could governments do to improve the situation? E.g. Laws to restrict certain activities or funding for new technologies.
- ✓ **Conservation** How could the natural world be helped to cope with these human activities and recover from damage already caused?

Choose one of your solutions and develop it further by thinking through how it could be made a reality. Think whether it might cause any new problems as it solves the issue you are seeking to address.

How do you think you should communicate your vision of the future to other people? You could create a poster advertising your idea or prepare a presentation.

When all ideas have been presented back to the class, consider how the world might be different if all these ideas were made reality. Is this a world you would want to live in?

Name(s):

Biome:

What problem are you trying to solve?
How is the biome being harmed and why is it happening?

Brainstorm your solutions using the categories to the left for inspiration.

Worksheet
Shaping the future



STEM Person of the Week

About this activity

You already share many of the characteristics of people working in STEM fields; they have the same skills and attributes that you already have. Creating a STEM Person of the Week card will allow you to explore the huge range of exciting STEM jobs, learn about the people who work in STEM and find out which skills you share with them.

Kit list

- ✓ A computer/laptop/tablet with internet access
- ✓ Pens and colouring pencils

Next steps

On the second page of the template, there's space for you to write down things that you've done to show how you have the same attributes as your STEM person. Make notes in the boxes each time you do something that demonstrates the attributes.

For more examples of STEM Person of the Week cards have a look at the sets at <https://nustem.uk/stem-person-of-the-week>.

Additional worksheets
on page 20-21

Instructions

- 1 Take a look at a STEM Person of the Week card, each card is made up of different sections:
 - ✓ The person's name
 - ✓ Their job title
 - ✓ A short description about what they do and how they show their three attributes
- 2 Now you need to find your own STEM Person who you'd like to showcase. Try thinking about the following things:
 - ✓ Diversity - search for engineers and scientists from all over the world.
 - ✓ Try to find current, working scientists and engineers instead of the ones you might usually find in textbooks. You could do an internet search, or you can visit the I'm a Scientist website to find someone interesting to feature: imascientist.org.uk
 - ✓ You might even find your STEM person in real life, perhaps you or your family knows someone who works at a local STEM firm, or maybe one of your family or friends already works in STEM - you could ask them to be your STEM Person.

- 3 Use the template on the next page to make your own STEM Person of the Week card, you'll need to add their name and a photo if you can find one. Then you can write your description about them, saying who they are and what they do. Make sure you mention three attributes that they use in their STEM role (you can use the table to find out about the different STEM attributes and what they mean).

Skills set

Curious, Open-minded, Communicator

Career options

Get everyone in the class to present their STEM Person of the Week to find out about some of the many different jobs and careers that are linked to STEM.



STEM PERSON OF THE WEEK



Name

Job Title

Attribute 1

Attribute 2

Attribute 3

Use this space to write about your STEM Person of the Week. Try to describe what they do and include three of the attributes that you think are best suited to their work.

nustem



- ✓ **Open-minded** people are willing to listen to new ideas and respect other people's views and opinions.
- ✓ **Hard-working** people put all of their effort into finishing things.
- ✓ If you are **tenacious**, you are able to stick with something difficult until it is finished.
- ✓ **Collaborative** people work together to do things.
- ✓ **Creative** people make new things and have original ideas.
- ✓ **Resilient** people can quickly recover from difficult or challenging things.
- ✓ If you show **commitment**, you stick with an activity and try your hardest to make it happen.
- ✓ **Logical** people can solve problems by thinking through them in a sensible order. They understand how one action can lead to another.
- ✓ **Passionate** people have strong feelings about things that interest them.
- ✓ If you are **imaginative**, you can think of new and interesting ideas.
- ✓ **Self-motivated** people like to do things for themselves without being told how to do them.
- ✓ If you are **patient**, you are able to stay calm when faced with problems.
- ✓ If you are **observant** you are quick to see things, you are able to spot fine details and are you good at paying attention.
- ✓ **Organised** people are good at planning to make sure they finish things.
- ✓ **Communicators** are good at sharing information and ideas with other people.
- ✓ If you are **curious**, you want to learn new things.

Worksheet
STEM Person
of the Week



STEM PERSON OF THE WEEK



Name

Job Title

Like

I am

Attribute 1:
(Use this space to explain how you show attribute 1)

Attribute 2:
(Use this space to explain how you show attribute 2)

Attribute 3:
(Use this space to explain how you show attribute 3)

nustem



Worksheet
STEM Person
of the Week



Innovating for the future

I'm a scientist

About this activity

What makes humans laugh? How do you measure the size of the universe? How do we use science every day? Ask real-life scientists your questions, connect with them through our online chat, and then vote for your favourite scientist to win £500!

Time

30 minutes to read about the scientists you're going to chat to and prepare your questions

40 minutes for the live chat

Kit list

- ✓ A computer/laptop/tablet with internet access
- ✓ A login card from your teacher

Next steps

Head to imascientist.org.uk/teachers for further information, including how you can ask questions and vote for your favourite scientist. You could also choose one of the scientists you chat with and use them to do the STEM Person of the Week activity!

Watch out!

Our chats are safe and secure with our friendly moderators, but never give out personal information, even your social media handles or gamer tags, online!



Instructions

- 1 Got a login card? Log into imascientist.org.uk/login with your username and password.
- 2 Click 'Meet the Scientists' in the menu bar and read through some of the scientists' profiles. What are they working on? Do you have anything in common with them? What would they spend the prize money on?
- 3 Prepare 2-3 questions for the scientists in your chat. You can see which scientists have signed up on your dashboard.

When it's time for your chat

- 4 Your teacher will tell you when to log in. Click 'Chat' at the top of the page to join the chat session!
- 5 Ask your questions and chat with the scientists - they're excited to answer your questions!
- 6 Have fun!

At home

Get the grown-ups at home involved with our fantastic evening chats! Safe, secure and moderated online chats take place every Thursday 7-8pm for some homework you'll definitely look forward to.

Skills set

Curious, Collaborative, Open-minded

Career options

Forget the school textbooks and just ask our scientists questions about what YOU are interested in. You might be surprised by how much science touches our everyday lives without us even noticing. Science is all around us and we benefit from science everyday... even if you don't become a scientist!

Innovating for the future

Planning for floods

About this activity

Flood risk management (FRM) is planning to help reduce the negative impact of flooding - for people, homes, businesses, infrastructure and the environment. There is a great deal of local and regional variation and FRM is constantly changing and evolving as the risk of flooding changes and evolves.

In this activity you will research and evaluate different approaches to FRM and create your own Flood Management Plan for your local area.

Time

2+ hours

Kit list

- ✓ Internet access

Next steps

Write a report about your project and submit it for a CREST Award at crestawards.org

Instructions

- 1 Research the risks of flooding in your local area.

- ✓ What weather conditions and scenarios are most likely to cause a flood?
- ✓ What would the impact be?

Create your own risk assessment, rating the different flood risks by likelihood and potential damage caused.

- 2 Think about the wider consequences of flooding in your local area. Which are the most problematic? Think about:

- ✓ Financial
- ✓ Social
- ✓ Infrastructure
- ✓ Business
- ✓ Domestic
- ✓ Agriculture
- ✓ Ecology (plants and habitat)
- ✓ Water quality

- 3 Research current flood management in your local area. Are the plans effective? Are there other parts of the world in a similar situation? Could you incorporate their strategies into your plan? How will you evaluate which measures have been successful or unsuccessful?

- 4 Use your research to build your own plan. You will need to consider mitigation and adaptation measures and consider:

- ✓ Who needs to be involved in flood management in your local area?
- ✓ What practical implications does your plan have in terms of costs and changes to infrastructure? Will your plan affect the local environment?
- ✓ Will any of your measures affect local people? How? What might the reaction be?

Use this Development and Flood Risk Practice Guide to help structure your plan: assets.publishing.service.gov.uk

- 5 Get some feedback and improve your plan. You could contact the local council or a water company to get a professional opinion.

At home

The UK is affected by six main types of flooding. Do you know what the differences are? Do some research to find out what causes these different types of floods, what the impacts are and what can be done to mitigate the risk of flooding.

Watch out!

Make sure you think about your research sources - are they reliable?



Type of flood	Description	Causes	Impacts	Mitigation options
River flooding				
Coastal flooding				
Surface water flooding				
Groundwater flooding				
Sewer flooding				
Reservoir flooding				

Worksheet
Planning for floods



At home

The UK is affected by six main types of flooding. Do you know what the differences are? Do some research to find out what causes these different types of floods, what the impacts are and what can be done to mitigate the risk of flooding.

Career options

Flood risk management opens a great range of exciting career opportunities such as being a Water Resources Planner, Demand Forecaster,

Research scientist/ Educator, Flood Defence Engineer, a Flood Warning Officer, working in Consultancy, as a flooding expert or working overseas in International Development and Emergency Relief.

Skills set

Patient, self-motivated, hard-working

Innovating for the future

Bringing data to life

About this activity

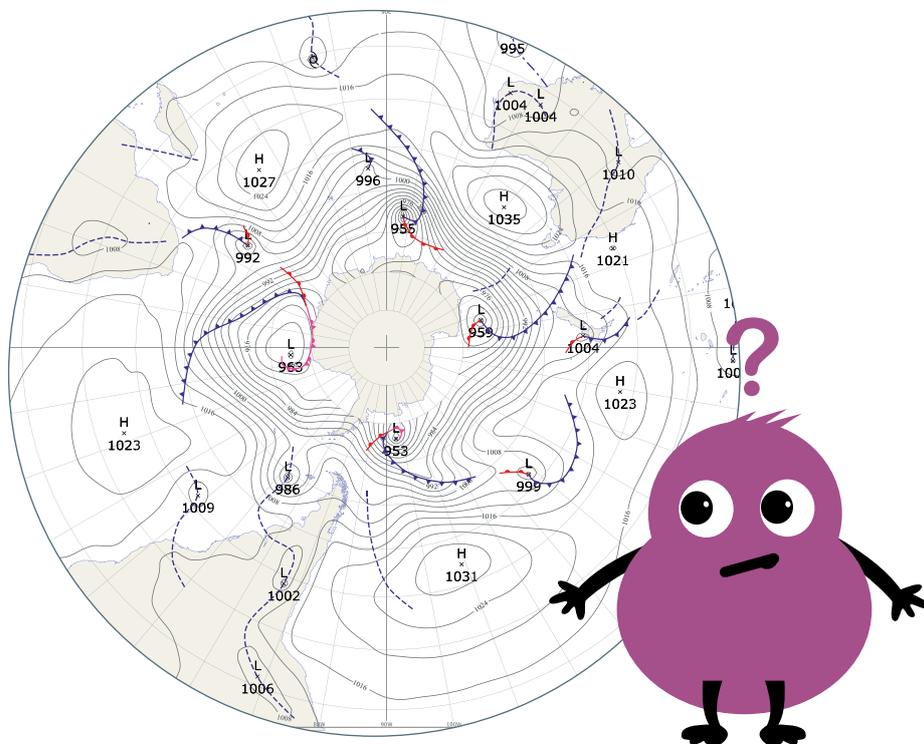
In this activity, you'll explore how people at the Met Office use their creativity to understand and visualise information about the weather. You'll assemble your own weather station to capture precipitation data, then think outside the box to present it in an interesting, creative way!

Time

45 minutes

Kit list

- ✓ An empty plastic bottle (2 litre fizzy drink bottle would be ideal)
- ✓ Scissors
- ✓ Sticky tape
- ✓ Ruler
- ✓ Paper and pencil
- ✓ Internet access
- ✓ Jelly, 3 or 4 cubes made up as directed on the packet
- ✓ Excel/Google Sheets to record data
- ✓ Craft materials (whatever you want – get creative!)



Instructions

In this activity, you're going to put yourself in the shoes of someone like Stephen to capture, analyse and visualise your own data.

- 1 Build a weather station: follow the steps found [here](#) to build a rain gauge and collect data on precipitation (rainfall).
- 2 Collect your data: check your rain gauge and log findings every day for 7+ days. What could you be doing to make it a fair test? Could you collect any other data to combine with your precipitation measurements?
- 3 Visualise your data: interpret and present your data in a creative way. If you're using graphs or charts, think about which ones will work best for the information you want show. You could also use code, Lego, building blocks, a stop-motion video, even a 3D model or stacked food cans!

Meet Stephen,
Scientific
Software
Engineer at the
Met Office



"We have so much data at the Met Office that one of our big challenges is finding the right pieces of information for the right people based on what their objectives are. It's important that this data is presented in a clear way to help individuals and organisations make the right decisions. One way of doing this is visualisation. Through pictures, graphs and maps, we can quickly see and understand new information about the weather. It's a great combination of art and science!"

Innovating for the future Bringing data to life

Next steps

To find out more about data visualisation, coding and the future of weather, check out our other activities here.

The Met Office provides free education content to support young people aged 7-14 to be prepared for the effects of weather and climate change on them and their communities.

Find out more at
[metoffice.gov.uk/schools](https://www.metoffice.gov.uk/schools)

Skills set

Observant, Creative, Imaginative

Career options

Stephen, our Scientific Software Engineer, went to school in South Africa, where he studied lots of different subjects, including maths, geography and computer science, before doing a degree in Electrical and Computer Engineering. University isn't the only option though – there are lots of training schemes and apprenticeships out there to get into this career. If you like solving problems, thinking creatively, learning and trying new things, you would be well suited to the job of a software engineer.

Think about your own skills and interests – how might they help you get into a career like Stephen?

Why not start researching different ways to get into your own dream job here: [metoffice.gov.uk](https://www.metoffice.gov.uk). Or check out these careers films on the [Met Office YouTube channel](#).

This activity also links to the following subjects:

✔ Computer science

✔ Maths

✔ Art and design

Watch out!

- ✔ Mop up any spilt liquids.
- ✔ Extra care should be observed when preparing the jelly with hot water.
- ✔ Do not eat the jelly used in this activity.
- ✔ Place your rain gauge away from busy areas to avoid people tripping over it.



Innovating for the future

Poster competition

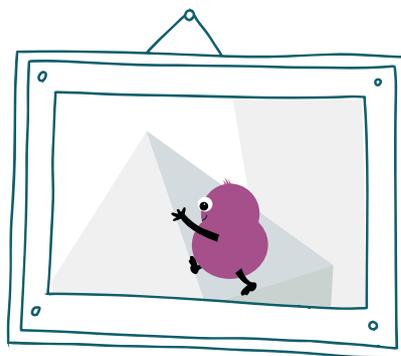
About this activity

Get creative and enter the British Science Association's annual poster competition. You can make your poster about whatever version of 'Innovating for the future' you like and enter our UK-wide competition with the chance to win an array of prizes. The activities found in this pack could be entered into the poster competition - simply look for the paintbrush symbol. Or you can use them to serve as a source of inspiration to get you started.



Kit list

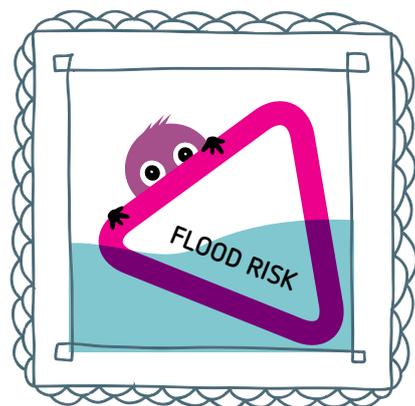
-  Paper (A4 or A3)
-  Creative materials, e.g. pens, pencils, scissors, glue, watercolours, paint, colouring crayons, pipe cleaners, felt, thread, wool, foil, clay, string, beads, stamps, foam, pompoms



Research your poster

Investigate and imagine 'Innovating for the future' and everything that makes it special. Here are some topic ideas to get you started:

- 1 Think about your own innovation – from inventing your own toy that you want to share with your friends to a useful machine that will help your family or the whole world! How will it change the ways of play, sports and leisure, entertainment, communications, work, or even school?
- 2 Feeling futuristic and global? Why not think about an innovation – new ideas, inventions, products or services we have never heard before that would make the world a better place?
- 3 Do you know someone who is an awesome innovator? Try to showcase their innovations and reflect on how this person's innovations impacted the lives of many.
- 4 Everyday innovations can be easily overlooked. Identify common innovations that you use daily and give a thought on how your life would be without them.



Make your poster

Once you've done your research, it's time to get creative! Your poster must be:

-  A4 or A3 size and you need to be able to take a photo of it to send to us online for judging.
-  You can use pop up pictures, pull out tabs or use materials such as paint, drawing pencils, crayons and paper.

Send us your poster

Posters will be judged on creativity, how well they fit the theme and how well the poster has been made or drawn. Once the poster is complete, scan or take a photo and go to the **British Science Week website** for more details.

Next steps

Celebrate! For more details, along with the full set of rules and tips for educators, check out our website britishscienceweek.org