BRITISH SCIENCE WEEK

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

BRITISH SCIENCE ASSOCIATION

Major Partner: Innovation

3M

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BRITISH SCIENCE WEEK

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.

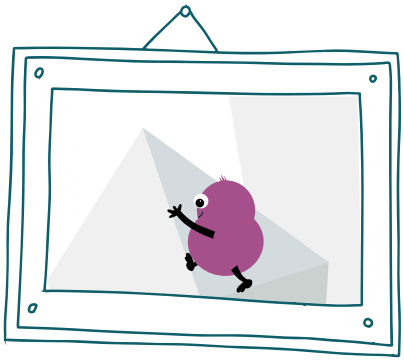
Kit list

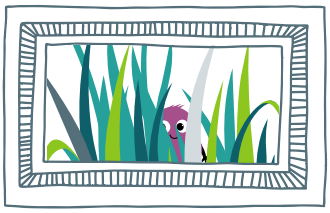
- Paper (A4 or A3)
- Creative materials, e.g.

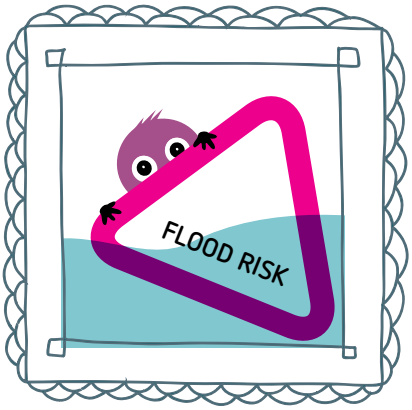
  pens, pencils, scissors, glue, watercolours, paint, colouring crayons, pipe cleaners, felt, thread, wool, foil, clay, string, beads, stamps, foam, pompoms

Innovating for the future

Poster competition







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

BRITISH SCIENCE WEEK

Leeds Museums & Galleries

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)

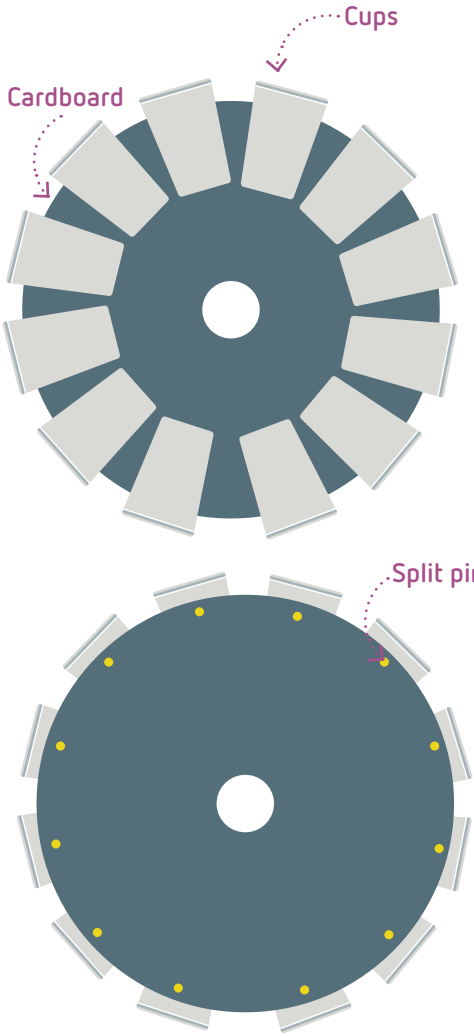
5. Try pouring water from different heights to see if the speed of the wheel changes or try increasing the stream of water and observe whether the wheel speeds up.

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	

BRITISH SCIENCE WEEK

WWF

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 **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

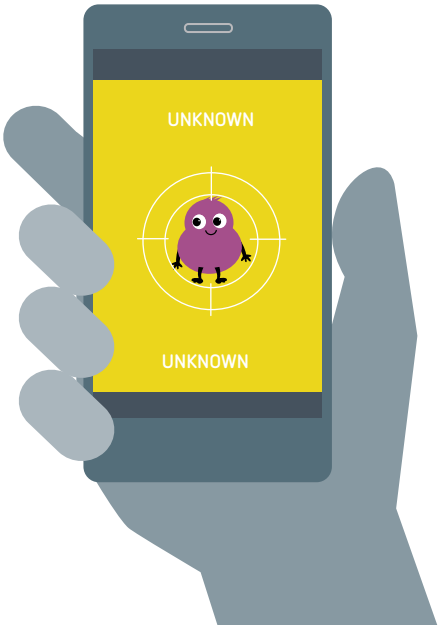
- After assessing the level of biodiversity in your chosen area, create an action plan to improve it.
- Consider the meaning of the term 'citizen science' and learn about its importance in helping scientists identify problems, understand them and then find solutions.
- Use the free *Seek* app to identify 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.



BRITISH SCIENCE WEEK

WWF

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.

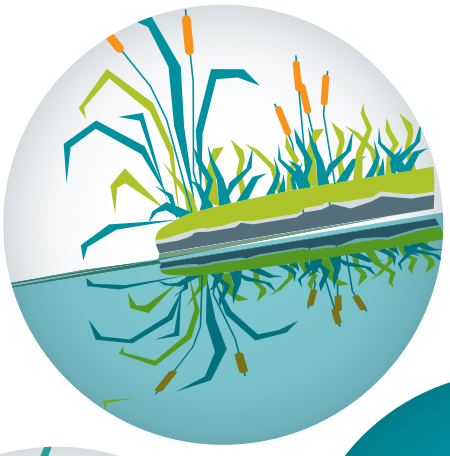
4 Present your idea using the worksheet provided, explaining how it would work and the positive effect it would have on the planet. Share and discuss your ideas with other groups and decide which ones could be the most effective.

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

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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

Watch out!

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

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.

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

BRITISH SCIENCE WEEK

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