



# 'Working scientifically' in primary science

## Develop children's skills in 'research'

### Introduction

Research enquiries are a great opportunity to use science lessons to practise reading and listening skills developed in English; children get to use a range of secondary sources to help them find the answers to their 'big questions'. Alternatively, children could plan research tools, such as questionnaires and interviews, to collect their own data. They are also an ideal type of enquiry to encourage collaborative learning in children, both in the researching and sharing of information, but also in presenting their findings to a variety of audiences. Research enquiries help to develop children's scientific literacy, as children learn to compare and evaluate information from different sources. As children learn to recognise the differences between fact and opinion, and consider the concept of bias, they develop life skills that will support them in being citizens of the 21st century.



### Big questions

Here are some examples of 'big questions' that can be explored through research in KS1 and KS2.

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
What are the most common British plants and where can we find them?	How does a cactus survive in a desert with no water?	What are all the different ways that seeds disperse?	Why are people cutting down the rainforests and what effect does that have?	What are the differences between the life cycle of an insect and a mammal?	What do different types of microorganisms do? Are they always harmful?
How are the animals in Australia different to the ones that we find in Britain?	What do you need to do to look after a pet dog/cat/lizard and keep it healthy?	Why do different types of vitamins keep us healthy and which foods can we find them in?	How do dentists fix broken teeth?	Why do people get grey/white hair when they get older?	How have our ideas about disease and medicine changed over time?
Do all animals have the same senses as humans?	What food do you need in a healthy diet and why?	Who was Mary Anning and what did she discover?	What are hurricanes, and why do they happen?	What are microplastics and why are they harming the planet?	What happened when Charles Darwin visited the Galapagos islands?
Are there plants that are in flower in every season? What are they?	How does the habitat of the Arctic compare with the habitat of the rainforest?	How does the Sun make light?	How has electricity changed the way we live?	How have our ideas about the solar system changed over time?	Why do some people need to wear glasses to see clearly?
How are bricks made?	How have the materials we use changed over time?	How have our ideas about forces changed over time?	How does a light bulb work?	What unusual objects did Jocelyn Bell Burnell discover?	How has our understanding of electricity changed over time?
Which materials can be recycled?	How are plastics made?	How does a compass work?	Do all animals have the same hearing range?	How do submarines sink if they are full of air?	How do astronomers know what stars are made of?

## 'Working scientifically' skills

Using research to find the answers to 'big questions' allows children to practise and develop a range of skills. Reading for information and note-taking form an important part in this process but, as children become more skilled in carrying out independent research, they will learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Children will learn to use a range of secondary sources, including books, websites, and video, to find their information. Where possible, children can listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters. As children move into KS2, they should be finding more data in their research and using this to help answer questions; it is even better if they start to collect their own data through questionnaires and interviews. At this stage, children should also be encouraged to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.

## Resources

There is a range of equipment that schools will find useful to support research enquiries:

Reference books on a range of science topics	WebQuest	iPads for online research
Collections of newspaper and magazine articles	Biographies of relevant scientists	Access to YouTube and BBC clips with an interactive whiteboard
Poster and leaflet-making materials	Video cameras	Line guides

## Reporting learning

This a fantastic type of enquiry for children to propose their own 'big question' to find out even more about the subject they are studying. It is much easier to manage a classful of children all following their own lines of enquiry with research than it is with any other type of enquiry. Research enquiries allow children to be creative in how they present their findings. Depending on what they are researching, children can create posters, leaflets, newspapers, reports or letters to report their findings in writing. Alternatively, children can use multimedia to share their learning by creating videos, presentations or even podcasts. Research enquiries also support children in learning about how scientific ideas have changed over time, and this can lead to the creation of timelines in various forms. This type of enquiry is also ideal for learning about how real scientists work, both interesting characters from history, but also scientists working in your local community.



## Additional information

Below are some useful links for video clips to support research enquires.

- BBC Class Clips is a huge collection of short video clips taken from a variety of programmes that are organised by topic. <https://www.bbc.com/education/subjects/z2pfb9q>
- Bill Nye the Science Guy produces fantastic science programmes for children in the US and his YouTube channel has a huge collection of clips taken from his shows. <https://www.youtube.com/user/TheRealBillNye/videos>

## Planning

### Curriculum Mapping

Identify a potential research enquiry in every science unit.



Aim for each class to revisit research in science five or six times over the academic year – linking with English and maths.



Plan to include scenarios where children get to suggest their own research enquiries and perhaps even carry them out at home.

### Progression Planning

Using National Curriculum documents, map out Age Related Expectations (ARE) for research enquiries.



Establish age specific success criteria for Research enquiries that are also in line with English and maths expectations.



Develop a collection of exemplar outcomes to support consistent expectations (WAGOLL).

### Resource Audit

Take stock of resources to support research enquiries including research packs, library books and tools to carry out online searches.



Provide teaching staff with a list of research materials appropriate for their class and mapped against their science units.



Build a collection of scientific data that children can use to answer their research questions (graphs, tables and charts).

### Support and Challenge

Ensure that teachers are aware of ARE for the academic years before and after the one they are teaching.



Teachers develop support materials for children working below ARE in their class. Examples include classroom displays, writing frames or sentence starters.



Teachers develop extension tasks for gifted and talented science learners that extend their 'working scientifically' skills.

### Quality Assurance

Review children's work to look for coverage of all enquiry types as well as progression and challenge across year groups.



Carry out a 'learning walk' while all classes focus on research enquires – identify good practice and highlight areas for development.



Lead pupil voice work that focuses on 'working scientifically', exploring children's perceptions on experiences and levels of understanding.

### Celebrate

Have a 'working scientifically' notice board with a display that changes to a new type of enquiry each half term.



Display high-quality examples of research enquiry work from each class and identify key features and progression.



As a special whole school focus, put in place a system of reward for individual success in 'working scientifically'.