BBC Terrific Scientific

Teachers Resources

Question

Question

Contents

Contents continued

What will the children learn? (England, Scotland, Wales & Northern Ireland)

England

Working Scientifically Yr5-6

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.

Using test results to make predictions to set up further comparative and fair tests.

Scotland

Outcomes

Develop curiosity and understanding of the environment and my place in the living, material and physical world P1.
Develop the skills of scientific inquiry and investigation using practical techniques. p 1.

Wales

Skills

Pupils turn ideas suggested to them, and their own ideas, into a form that can be investigated. p 12.

Northern Ireland

Developing

Develop self-confidence and self-esteem in expressing and sharing their thoughts and ideas and developing an appreciation of the beauty and wonder of the world. p 83.

To ensure maximum engagement, children should have completed at least 3 other Terrific Scientific investigations before undertaking this investigation.

Through these activities children will:

- **Generate** scientific questions.
- **Identify** what makes a good scientific question.
- **Evaluate** their own questions.
- Choose one of their questions to **investigate further.**
- **Conduct** their investigation.
- **Communicate** the outcome of their enquiry to their class, school, other schools in your area.

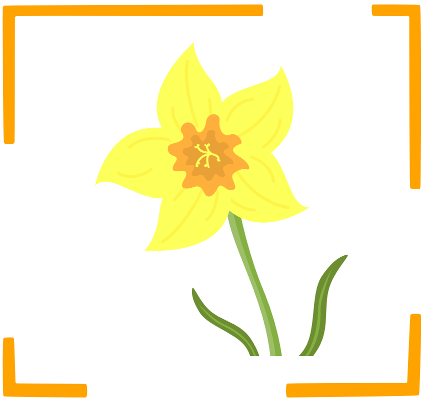
Resources

- Terrific Wonders
- Data Dives
- Spectacular Sights
- Question Spinners
- Question Sieve
- Enquiry Selector

Health & safety

It is an important part of planning a scientific enquiry that pupils consider their health and safety and that of those around them. However ultimately, as with any other school activity, the teachers are responsible for undertaking any necessary risk assessments and ensuring that their pupils are safe.

Introduction



In this investigation your children will take the lead. Returning to their favourite Terrific Scientific topic, they will create their own enquiry questions, and select one to investigate further on their own. Practical enquiry is at the heart of good learning in primary science. It is important to develop children's independence as scientists, and to make sure that they have ample opportunity to make decisions and be able to follow an enquiry through for themselves. As teachers we often hold back from doing this, unaware of how capable our children truly are. This investigation provides an ideal opportunity for children to make that first step of being independent and also to try out their own ideas and to see where it leads.

What follows is a tool kit for teachers, with several different strategies to choose from to help your children to lead their own enquiries. Questions may lead to one of five different enquiry types. These may be practical or research based, depending on which method is best going to answer the question. Your role as a teacher is to support children as they work through their investigation and also to support your children practically and signposting them to resources which could help them as they seek an answer to their question.

Scientists come up with questions all the time. In fact, one investigation will often prompt a whole other raft of questions, which could be explored. Not all questions that people ask are scientific, some are just general questions. We can define a scientific question by asking if the question can be answered by gathering evidence using one of five scientific enquiry types – Classifying and Grouping, Pattern Seeking, Observing Over Time, Research Using Secondary Sources and Comparative and Fair Testing. If the question is too vague or overly technical, requiring specialist equipment, it is unlikely children will be able to answer within the confines of a primary school classroom. The answer to a non-scientific question may well be different depending on who you ask, or which sources you read.

A key part of the learning in this investigation is to help children to consider what makes a useful scientific question that they can investigate, to assess which questions are relevant and realistic and to set about finding an answer. Once the question has been answered then the next stage is for your children to tell other people about what they have learnt.

Communication is very important in the scientific community. Scientists share ideas and learn from each other and talk about their work. They attend conferences, write up and publish their reports in scientific journals/ magazines, create posters, make TV and radio programmes and tweet and blog about their findings. So, to celebrate your children's amazing discoveries, we are encouraging schools to create opportunities for their children to share their work with a wider audience – through joining in with the Terrific Science Share.

As well as key working scientific principles, we have made sure there are links to the science curriculum for each nation.

On our website you will find a supporting 'Intro' film which shows teachers and teaching assistants how to set up and carry out their own investigations. You will also find additional resources including a step-by-step lesson presentation.

We originally partnered with the University of Manchester for this investigation. We hope it inspires you and your students to get scientific and we look forward to seeing your investigations.

The Terrific Scientific Team.

Supported by: The Great Science Share for Schools, The Primary Science Quality Mark, The Primary Science Teaching Trust and The Big Bang.

Investigation overview

To get started, watch the two part introduction film with your class. After watching part one, work with your class as they come up with the questions they'd like to explore, and start to plan their investigations before they watch part two. Encourage your children to discuss what they think will happen next. What do they think the children in the film will find out? What ideas do they have for their own investigations?

1. Choose a previous investigation to revisit. Depending on the needs of your class, you may prefer to all look at the same investigation or throw it open and allow the children to choose which one of the Terrific Scientific investigations that they would like to revisit.

2. Choose a stimulus to give the children, in order to promote their curiosity. There are three types of stimuli they could explore: Terrific Wonders – Short Practical activities, Data Dives – Graphic Stimuli or Spectacular Sights – Picture Stimuli. Encourage the children to create as many questions as they can from the stimuli.

3. Help the children to build questions themselves. Some children might need some support with building a question, in which case you may like to use the Terrific Spinners – which provides children with question stems and subjects for their questions.

4. Using the Question Sieve, ask the children to sift through and evaluate their questions. Finally, ask the children to choose one question to follow up as a full investigation.

5. Use the Enquiry Selector to help decide what type of enquiry will help the children to answer their question.

6. Support the children as they carry out their investigation.

7. Once the children have completed their investigation encourage them to tell others about their learning.

Tip:

Encourage the children to make a reasoned prediction.

Getting curious

To help children to explore the science behind the terrific scientific investigations, we have produced some resources which can be used to refresh their memories and stimulate further questions:

- **Terrific Wonders –** short practical activities, which will then promote discussion and lead to further investigations.
- **Data Dives –** graphs and charts, showing some of the outcomes from the initial investigations, which may then prompt new questions for investigation.
- **Spectacular Sights –** images, which are designed to promote discussion and lead to investigation questions.

It is hoped that the stimuli will promote curiosity and inspire new questions, which pupils could then follow up through scientific enquiry. Simply choose which investigation you wish to look at in more depth. Have a look at the stimuli and start creating questions.

Terrific wonders

Short practical activities, which will then promote discussion and lead to further investigations.

Choose one of the practical activities below. How could you use them to explore these ideas more fully?

Taste

You will need:

Blindfold / 3 different flavours of crisps.

Activity:

Do this activity in pairs. Person one wears a blindfold. Person two gives different flavour crisps to person one. Can they identify the flavour of the crisp just by their taste?

Discuss:

Do you think that it is harder to taste when you can't see what you are eating?
What else could you investigate?

Water

You will need:

Two glasses / Water / Salt / Two uncooked eggs in shells.

Activity:

Fill both glasses with tap water.
Add 5 tablespoons of salt to one glass and stir to completely dissolve the salt in the water.
Place an egg into each of the glasses and observe what happens.

Discuss:

How are the two glasses of water different?
What do you notice?
Why is it happening?
What else could you investigate?

BBC Terrific Scientific

Important!

Do not work under trees in high winds. Check trees for signs of dead wood which could fall. Choose healthy trees to work with. Teach children not to touch any fungus and to always wash their hands after working outside.

Trees

You will need:

Blindfold / Trees

Activity:

Do this activity in pairs.

Person one wears a blindfold. Person two leads the blindfolded player to a tree.

Upon meeting the tree, person one explores the tree through touch - feeling the texture of the tree's bark, measuring the tree with their arms, looking for any special characteristics that the tree has.

After getting to know their trees, the blindfolded players are gently brought back to the starting point, where their blindfolds are removed.

They then try to find their tree.

Discuss:

How did you know it was your tree?

How could you investigate trees further?

Time

You will need:

Photo of a grandfather clock / String / ruler / lump of modelling clay / stopwatch /

Activity:

You are going to make a pendulum.
Cut a piece of string. Tie one end to the middle of a ruler.
Add a blob of modelling clay to the other end of your string.
Place the ruler between two tables so that the pendulum hangs freely between the tables.
Pull the weight of the pendulum back about 30 degrees.
Release the pendulum. Watch what happens.
Can you adjust the pendulum so that it swings once each second?

Discuss:

What else could you investigate?
Can you create a reliable method for measuring time?

Forces

You will need:

Paper and instructions for making a paper aeroplane.

Activity:

Ask the children to make and play with their paper aeroplane

Discuss:

What did you notice?
When you fly a paper aeroplane, which forces are at work?
What else could you investigate?

Exercise

You will need:

Funnel / Cardboard Tube / Tape

Activity:

Do this activity in pairs. To make a homemade stethoscope – place the narrow end of the funnel into the tube and tape it in place. Use the stethoscope to listen to each other's hearts. Place the funnel end flat against your partner's chest. Put your ear against the hole at the end of the cardboard tube.

Discuss:

What can you hear?
Can you hear your partner's heartbeat?
What could you investigate with a stethoscope?

Feet

You will need:

Chair / Blindfold / Familiar objects

Activity:

Do this activity in pairs. Person one should have bare feet and be seated on a chair. This person needs to be blindfolded. Person two will place an object by the feet of the person one, who then has ten seconds to feel the object with their feet. Can they identify the object?

Discuss:

Were you able to identify it within the given 10 seconds?
Did you feel it was easy or hard to identify the object with your feet than your hands?
What else could you investigate?

Power

You will need:

Balloon

An interior wall

Activity:

Blow up the balloon.

Rub the balloon on the wall.

Let go and stick the balloon to the wall.

Discuss:

What did you notice?

What is causing the balloon to stick to the wall?

What else can you investigate?

Grow

You will need:

Broad bean seeds / Magnifying glasses / Cup of water

Activity:

Soak the broad bean seeds in the cup of water overnight so that the skin softens up.

Ask the children to peel the seed and to have a look inside.

Discuss:

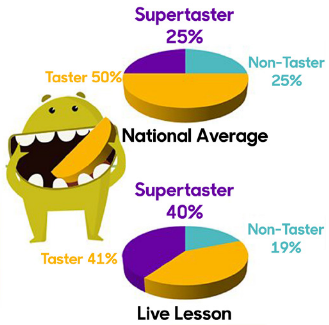
What can you see? What do you think all the parts of the seed do?

How could you investigate seeds further?

Data dives

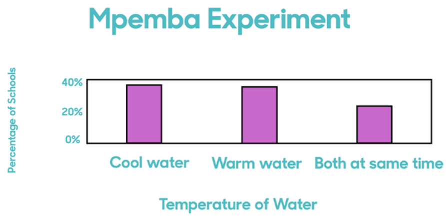
Graphs and charts, showing some of the findings from the initial investigations, which may then prompt new questions for investigation.

Take one of the graphs below and interpret the data.
What does it show? What further questions could you investigate?



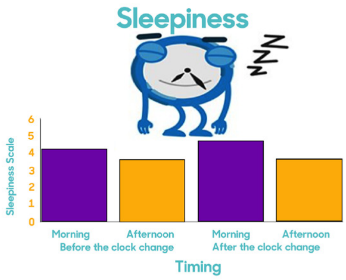
Taste

In this investigation children looked to see how many fungiform papillae each person has. How do the number of supertasters compare in the Live Lesson to the national average? How does our class compare with this data? How could you investigate taste further?



Water

In the Water investigation, children looked at the Mpemba effect. They tested whether warm water froze faster than cold water. They also looked to see if water hardness was a factor in making the Mpemba effect likely to happen. Do you think that the results in the table above support the Mpemba effect? Explain your answer. How could you investigate further?



Time

In this investigation, children looked to see if the clock change affected their levels of sleepiness. They also looked to see if children were more or less sleepy in the morning or afternoon.

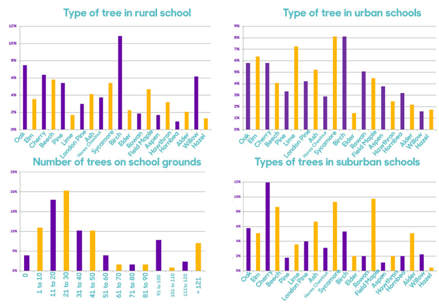
What does this graph show?

Do you agree with the results?

How reliable do you think they are?

Do you think these results are always / sometimes / never true?

How could you investigate time further?



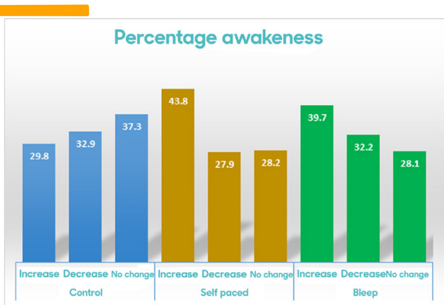
Trees

In the Tree investigation children did a survey of what type of trees they had in their school grounds. They used this information to work out how much carbon is stored by the trees on their school site.

What is the most common type of tree in rural schools / urban / suburban school grounds?

How could we compare our school with this data?

How could you investigate trees further?



Exercise

In this investigation children investigated whether exercise helps them to concentrate better in class.

They investigated:

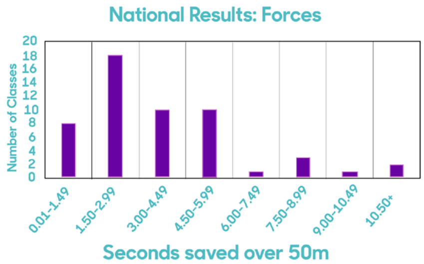
- Running to a bleep (Maximum effort)
- Self-Paced Exercise (Moderate effort)
- Control (No exercise).

Which form of exercise made the most impact on children's levels of wakefulness?

How reliable do you think these results are?

How could teachers use this research to plan your day at school?

How could you investigate exercise further?



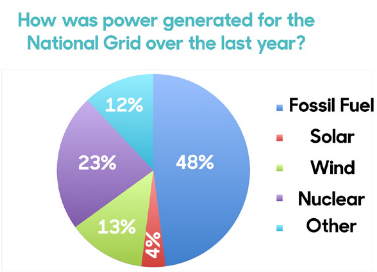
Forces

In the Forces investigation children were challenged to create a wacky outfit to slow their runners down. The outfits created air resistance. Resistance training is used by athletes to make their muscles work harder.

What was the least / most amount of time saved by the air resistance outfits?

What was the most frequent amount of time saved by the air resistance outfits?

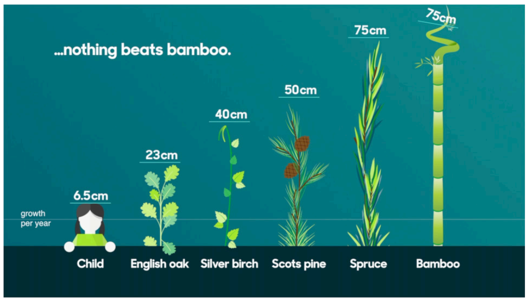
How could you investigate air resistance further?



Power

In the Power investigation, children surveyed their school to see how much power they could save. Electricity is generated using power from lots of different sources, including fossil fuel, nuclear energy and alternative energy.

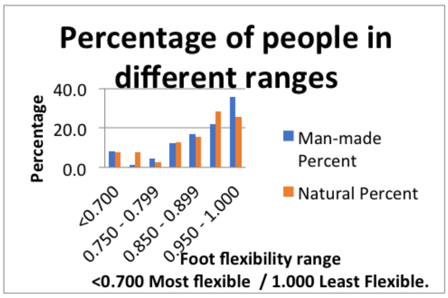
Over the past year, which source of power was used to generate the most electricity? Why do you think that less energy was generated from wind or solar? What is fossil fuel? What is alternative energy? Why is alternative energy better for the environment? Does your school generate any alternative energy? How much? How could you investigate power further?



Grow

In the Growth investigation children investigated which were the best conditions for growing spring onions. Different plants grow at different rates. The Saguaro cactus is a very slow-growing plant. It only grows about 2.5cm each year. However, some plants grow very fast. The world record for the fastest-growing plant belongs to a type of bamboo, which has been found to grow up to 91cm per day.

Look at this graph comparing the growth rates of four trees over a year. What is the difference in speed of growth between the fastest and slowing trees? How much does each tree grow in one week / one day?



Feet

In the Feet investigation, children tested the idea that people who spend time on smooth, man-made surfaces will have less flexible feet than those that spend time on natural, uneven surfaces. Generally, children's feet were not very flexible. However, we can see that the children who played more on the natural, uneven surfaces have slightly more flexible feet than those who spend more time on smooth surfaces.

How could you investigate foot flexibility further?

Does the type of shoe that children wear affect their foot flexibility?

Does the sport they play affect their foot flexibility?

Spectacular sights

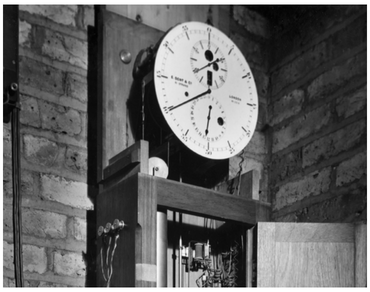
Images, which are designed to promote discussion and lead to investigation questions.

Taste - Vegetables

I wonder...

Water - States of matter

I wonder...



Time - Water clock

I wonder...

Trees - Birches

I wonder...

Forces - Skydiver

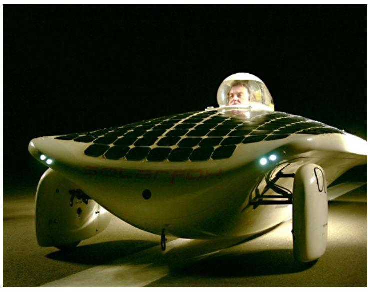
I wonder...

Exercise - Marathon

I wonder...

Feet - Prehensile feet

I wonder...



Power - Solar powered car

I wonder...

Grow - Daffodils

I wonder...

Question building

The children may have come up with lots of questions already- in which case that's brilliant. Some children may need a little support when coming up with questions - try using this Question Spinner to help them generate questions.

Question spinners:

Question Spinners are an optional tool for supporting children to create their own questions. Using the top spinner on the next page to provide the question stem and the bottom spinner to provide the question subject. The idea is to provide children with vocabulary, which they can use to form their own questions. It is important to allow children to think freely and to be creative. They will evaluate and sort their questions later.

Ask:

Can you still taste things if you can't smell?

Do things taste the same if you can't see what you are eating?

Resources: Spinning boards / Large paper clip and Pencil.

1. Place a paper clip in the centre of the spinner board. Position the tip of a pencil in the end of the paper clip and spin the paper clip around. Where does the paper clip stop?

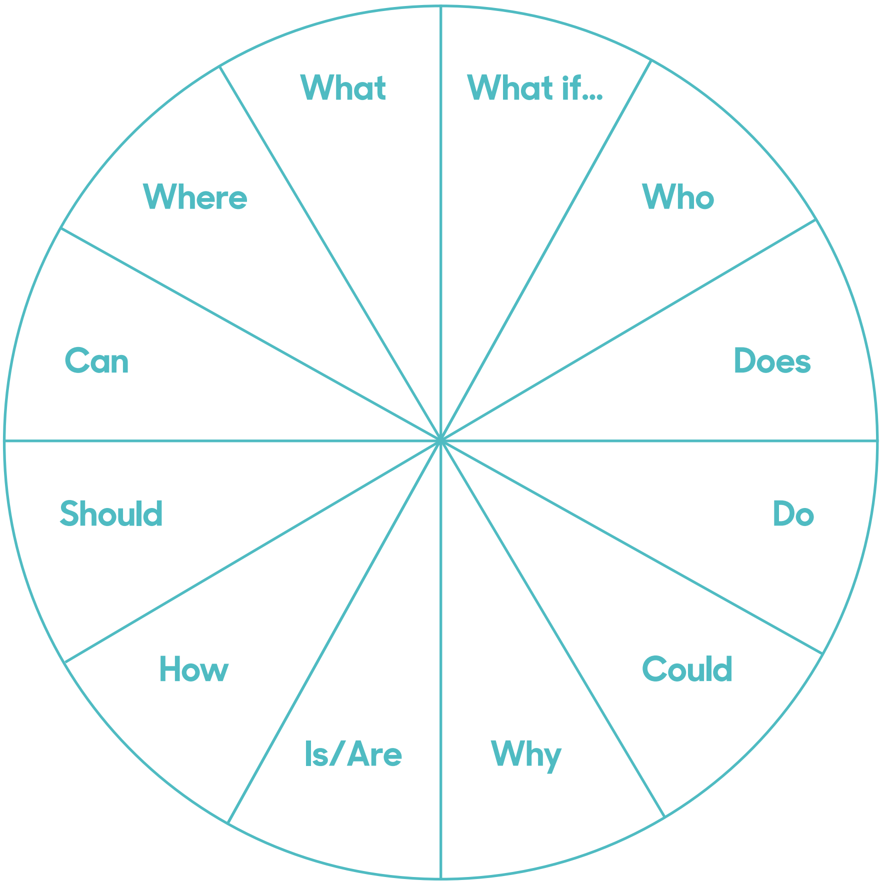
2. On each turn, use the spinner to select a question starter and then a subject.

3. Use the words you have selected to create your own questions.

4. Create several questions, so that you have plenty to choose from.

5. We have given two examples below. The top half of the spinner can be used to generate questions for the Taste investigation, the bottom half relates to Grow. You can make your own question spinners by adding your own images.

Question building cont.



Question sieving

Ask:

Ask the children to use the Question Sieve to help them to evaluate their questions.

In this part of the enquiry process, your children are going to sift through their questions. First they will evaluate whether their question is a scientific question. Secondly, they will evaluate whether their question would make a good scientific enquiry. Selecting a question that can be answered by gathering evidence takes some skill. There will be some questions that pupils could investigate through their own practical enquiry; other questions that would require research using secondary sources and then other more complex questions, which would require a sophisticated laboratory and therefore are not practical to pursue
in a primary classroom.

Ask the children to use the Question Sieve on the next page to help them to evaluate their questions. Print out several versions of the sheet below and hand them out to your students. There is space to write under each question.

Question sieving continued

What is my question?

Can I collect evidence to answer my question?

What type of enquiry does my question lead to?
(See enquiry flow chart)

Can I answer my question on my own or do I need some support?

What sort of equipment would help me to answer my question?

Is my question realistic, can I answer it with the resources available to me?

Is my question clear? How could I improve my question?

Why isn’t ‘best’ a good word for a scientific question?

We often ask which is best? Best isn’t a word you should include in a scientific question because it isn’t specific. What does best mean? For example, if you ask ‘Which is the best compost for growing tomatoes in?’ It is a perfectly reasonable question to ask, however we don’t know how to judge best. We need to ask a question, which gives clear criteria to judge the effectiveness of the compost. We need to consider which variable we might measure in order prove which was the best compost. For example: In which compost did the tomato plants grow the tallest? Or, in which compost did the tomatoes produce the most fruit? The variable we are changing is compost, and the variable we could measure could be either the height or the tomato plant or the number or tomatoes the plant produces.

Tip:

Use the table on the next page to refine your scientific questions.

What does a good question look like?

All questions should be valued; however, some will make better primary science investigations than others. The table below shows a few questions, which have been altered to make them more suitable for practical investigation.

Initial question	What's the problem?	An even better question would be...
What is static electricity?	This is a really complex question, which requires a high-level answer, which may be too complex for younger children to answer yet. However, they could still explore static electricity through practical observation. For example: How can you alter the amount of static electricity? Does everything produce static electricity?	Does the number of rubs on a balloon affect how many objects it can pick up?
Which is the best grass seed?	Best isn't very specific – So it would be preferable to refine the question and make it more specific. How could you define best? Try thinking about which variables you could investigate.	Which grass seed germinates the fastest? Which grass seed produces the greenest grass? Which grass seed grows into the strongest plants?
How does size and shape of a balloon rocket affect the time it takes to travel along the string?	This question has two independent variables – SIZE and SHAPE. It is better to choose one variable at a time to investigate, then you can really see what effect it has on the time it takes for the balloon rocket to travel along the string.	How does the size of the balloon rocket affect the time it takes to travel along the string?

What if I don't know the answer?

Remember:

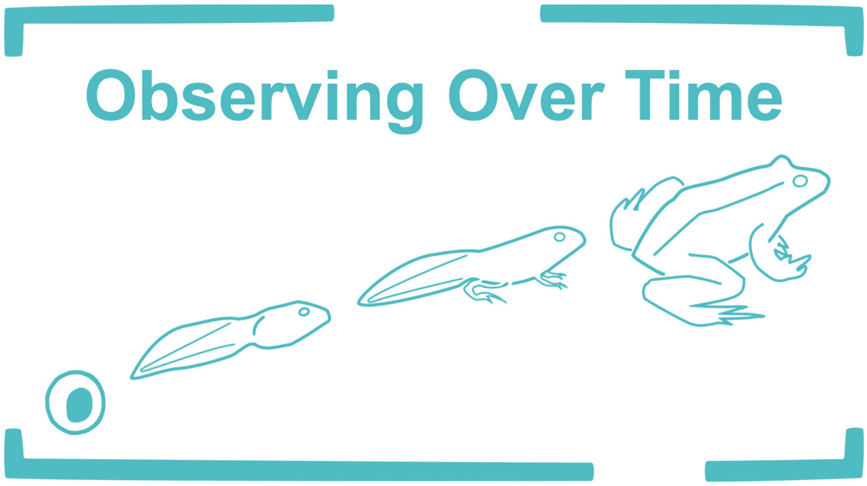
There a range of tools to help you decide on which question to choose and see the guide on child led enquiry available on our website.

Many teachers feel anxious in science lessons because they are afraid that they won't know the answers to the questions that their children pose. If that's you, don't worry about this. There will always be questions that children ask that you don't know the answer to. That's the joy of learning that you can explore together. Just make sure that the children have evaluated their questions so that they are both relevant and realistic. Use their question to help them think around the problem. Ask them where their question comes from? What do they already know about this topic? Help them to think of evidence they could collect or find to answer their question.

Remember to be realistic and pitch your guidance appropriately for their age group. Look at ways of exploring the question within the realms of accessibility. In terms of practical enquiry, look for things that you can observe or measure, with the equipment you have. Avoid using jargon and ensure that technical vocabulary is explained. Check that everyone understands the terminology and can apply it accurately. Don't be tempted to follow questions which require PhD level answers - if you go in that direction, everyone will get lost and confused. There will be a simple, age appropriate way to investigate many questions that children ask. On occasion however, children might ask a question which doesn't have an answer yet. Many of us have very complex questions, to which there is no known answer. These are genuine questions, which need to be respected, valued and dealt with honestly.

Selecting types of enquiry

By now, your children will have come up with all sorts of interesting scientific questions that they investigate. There are five different types of enquiry that your children could use in order to answer their scientific question:



Observation over time – How does something change?

Children observe or measure how one variable changes over time. The amount of time can vary from really short to much longer periods of time. Observations can be recorded in a number of ways: tables, notes, diagrams, diaries, journals and logs – whether by hand or using IT.

Example: What happens to my spring onion plant over time?

Here the variable is the spring onion and observations might include length, colour, thickness and appearance.

Classifying and Grouping

Classifying and grouping – How are things the same or different?

Children identify features of different things, looking for similarities and differences and where possible sort them into groups. It is also useful to use published guides or keys to help them identify individual objects such as plants, animals, rocks or materials. Classifying and grouping links with data handling in mathematics so children can use strategies they are familiar with to help them to describe how they have sorted e.g. Venn diagrams, Carroll diagrams, branching keys.

Example: Which tree does this leaf belong to?

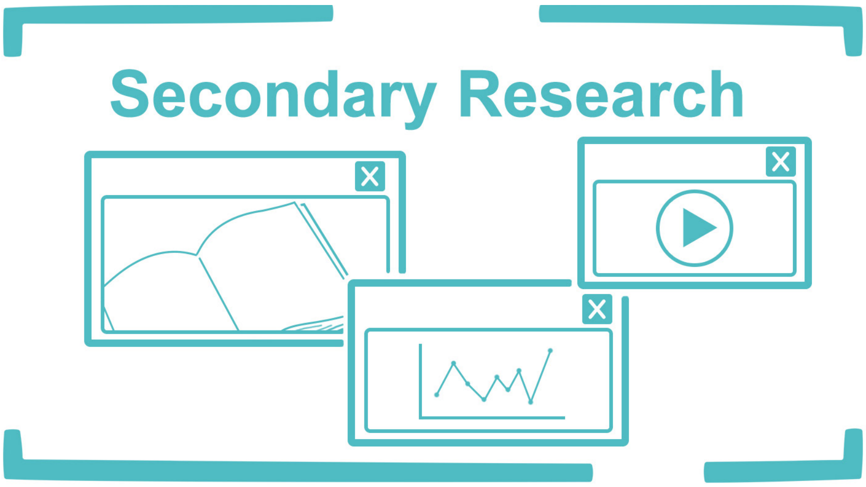
Children might use a published key that describes characteristics of leaves to identify the tree it came from. For example: shape, colour, number of leaf points or leaf size.

Pattern seeking – Is there a pattern in the observations I make?

Children choose two variables and investigate the relationship between them, looking for patterns; this differs from a fair test because they are not looking for a cause and effect relationship.

For example: If we wanted to know if there is a correlation between the height of a tree and its circumference we examine these non-controllable variables and look at the relationship between them. Many pattern-seeking enquiries will lead to a survey, where children can plot and compare discrete points of information alongside one and other. In these cases, a scatter graph can be a useful tool for highlighting relationships between the two variables.

Examples: Is there a pattern between leaf size and height of the tree? Is there a relationship between your height and your foot size?



Research using secondary sources – What is already known about this?

Children use a range of secondary sources of evidence to answer their questions. It is a really useful skill to be able to access information and then use and apply it creatively to further their own understanding, and one that links well with literacy development. The important aspect of working scientifically in this way is to encourage children to learn to be critical and evaluate the quality of the information before them, to check the sources are reliable and the information is accurate.

Examples: What is renewable energy? Do fossil fuels have a negative impact on the environment?

Related links:

View the BBC news Live Lesson which discusses how to recognise reliable sources.

Comparative Fair Testing

Fair and comparative testing - What is the effect of a change on something else?

Both of these enquiry types are similar.

Fair testing

In Fair Testing children look for a cause and effect, by identifying the effect of changing one continuous variable, whilst attempting to keep all other variables constant.

For example: Children find the temperature of water that will melt ice cubes the quickest by dropping ice cubes into containers of different temperatures of water. In this case there are two things that change during the process of the investigation – the temperature and the time for the ice to melt. This data is described as 'continuous data', which could be displayed in the form of a line graph. Conclusions are expressed as a comparison of two continuous data sets: the higher the temperature of the water the faster the ice melts.

Comparative Testing

Children identify the effect by comparing one variable with another, changing only one categoric variable at a time, whilst attempting to keep all other variables constant.

For example - How can you go faster down a slide? Which material could you use to slide down quicker? How does body position effect speed? Children would experiment with different combinations to find the fastest speed.

Here they are changing categoric variables by comparing how separate surfaces e.g. nylon, cotton and plastic affect how long it takes to travel down the slide. They are also changing body position to effect air resistance. The results of a comparative test will be in the form of discrete data, which could be displayed in the form of a bar chart.

Example: How does changing the air resistance of a toy car on a ramp affect speed?

Enquiry selector

Ask:

Can supertasters taste more flavours of ice cream than non-supertasters?

Use the enquiry selector flow chart below to help you to identify which enquiry type will help you to answer your question. Before you begin, ask your children to highlight any key words or variables in their question. Encourage them to think about whether their question could lead to a practical enquiry or not. With this information the flow chart will help them think about how best to answer their scientific questions.

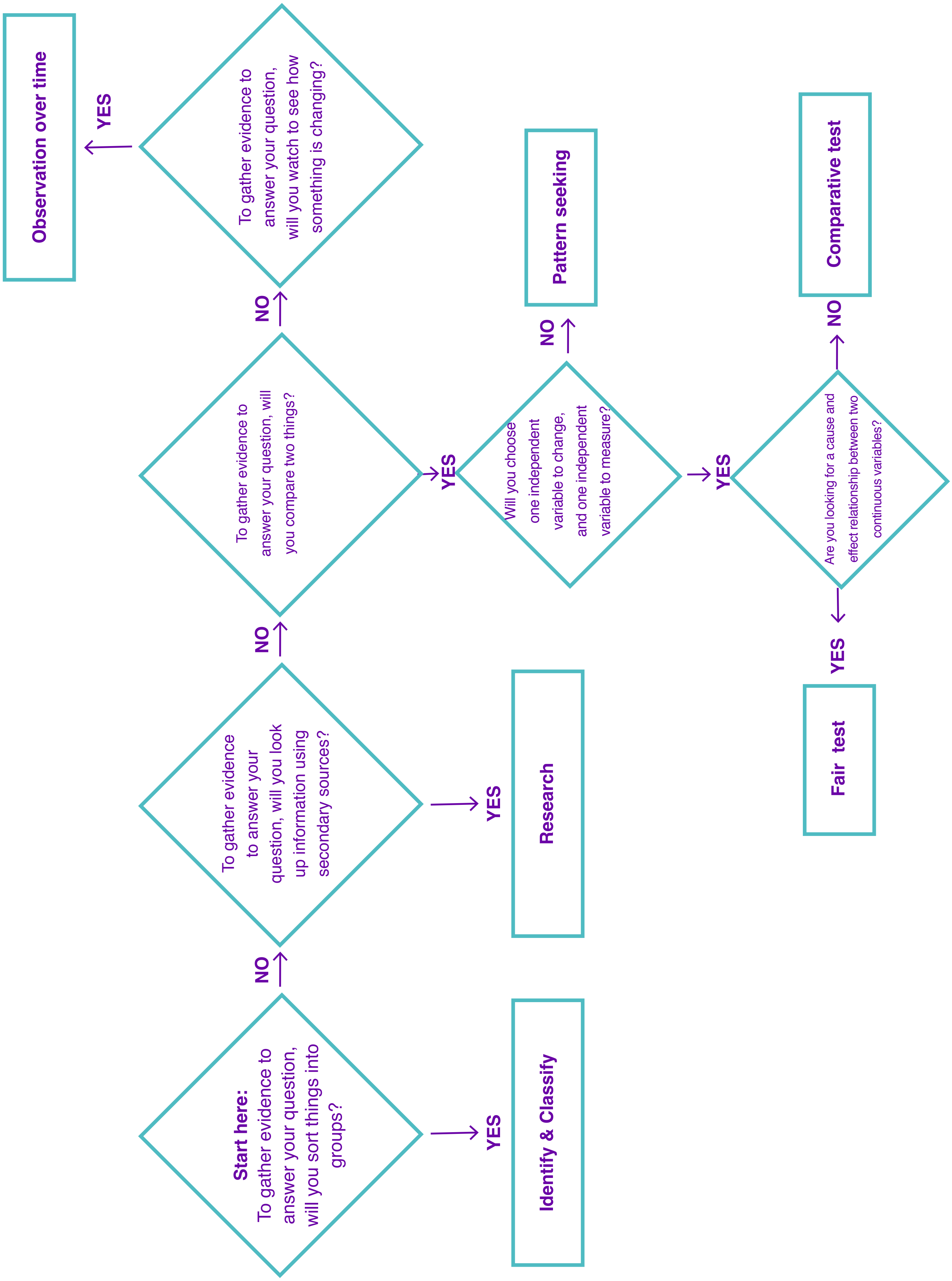
We can highlight two variables in the supertaster investigation:

- Variable 1 = the type of taster (supertaster or taster)
- Variable 2 = number of flavours recognised

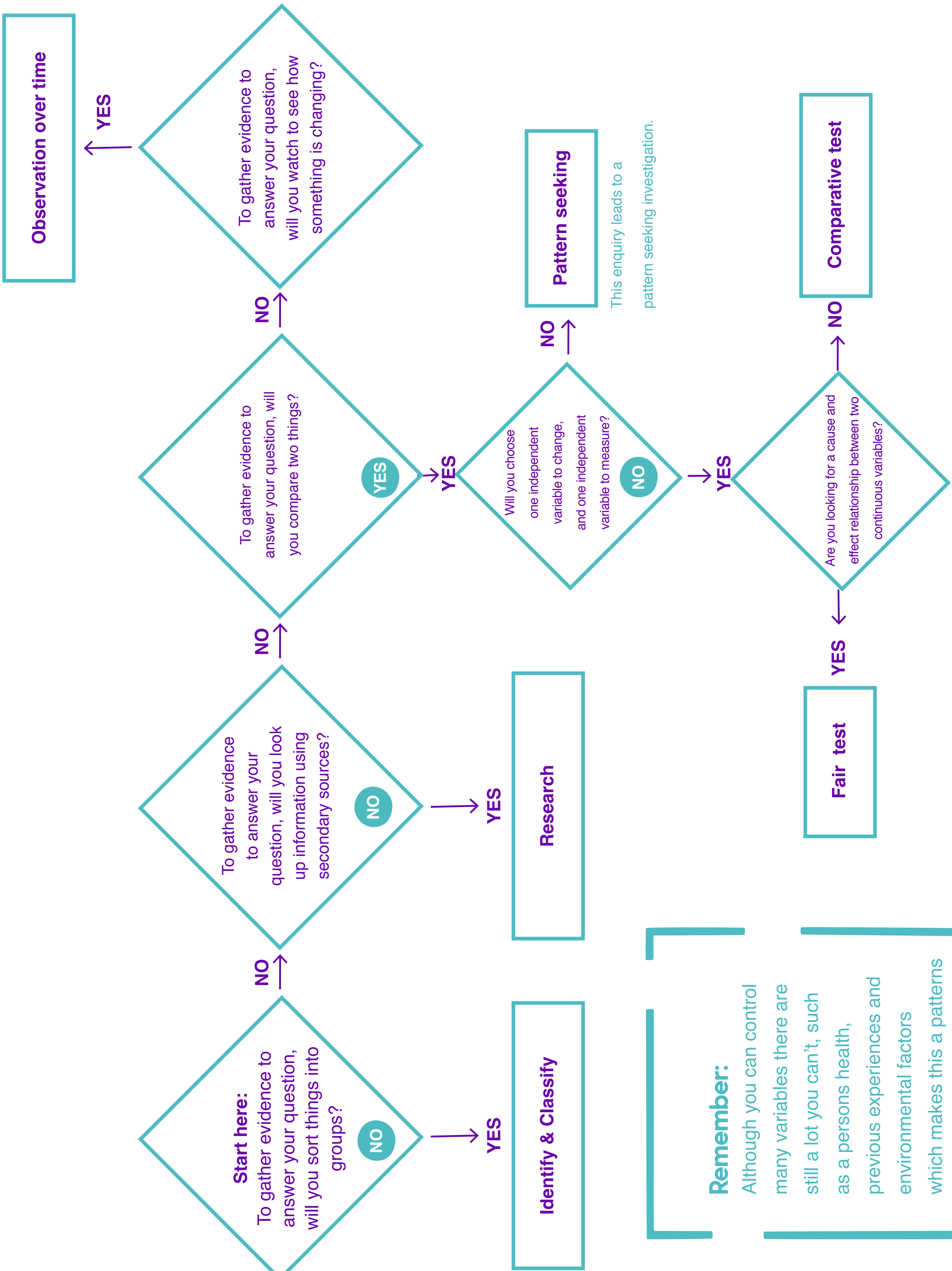
If we work through the flow chart, we can see that we are comparing two things.

We can control the amount of ice cream, the colour of the ice cream and how the ice cream is given to the taster. However, we cannot control things about the tasters such as their health, how they are feeling and their past experience. So, this a pattern-seeking test.

Enquiry selector



Can supertasters taste more flavours of ice cream than non-supertasters?



Remember:
Although you can control many variables there are still a lot you can't, such as a persons health, previous experiences and environmental factors which makes this a patterns seeking investigation.

Spreading the news

Once the evidence has been collected and analysed, scientists need to share what they've found out with each other. They do this by publishing their work in scientific magazines, going to conferences and creating posters of their work. This helps scientists to make their work even better and to learn from each other. **Communicating with other scientists can even inspire them to come up with totally new questions. Scientists also love to talk about their work with everyone!** There are numerous ways in which they tell other people about their research: blogs, newspaper articles, reports, papers, stories, poetry, TV and Radio. It helps them reach lots of different people and who knows what might come from this? Maybe an author will be inspired to write a great story, a clothes maker will learn about a new material or a musician will develop the idea to create a new way to make music! By telling other people about their learning, your children are going to develop their skills of scientific communication and their powers of explanation.

Communicating their findings enables children to sort and embed their thinking. It promotes discussion and enhances the idea that science is a social process where we all learn from each other. This communication stage follows the enquiry process; it allows children to revisit their learning and share their ideas with a new audience, who will ask questions thus prompting them to think more deeply about their findings. Encouraging children to communicate their learning to others is a really valuable tool for assessment, providing teachers with a rich opportunity to see what children truly know and understand.

Remember:

Encourage children to communicate about their learning with others.

Ask:

What was your initial question?

Did you have any surprising or unexpected results?

Where there any challenges that you overcame or new questions that popped up as you worked?

There are lots of ways that your children could write about or tell others about their investigation. They could:

- Summarise their investigation in 25 words. This could be shared on the school newsletter or in a display.
- Write an article for their school newspaper.
- Design a poster.
- Give a talk to an audience i.e. in an assembly.
- Write a blog or journal about their investigation.
- Make their own science TV or Radio programme.
- Create a presentation using slide creation software and share it with their class.
- Create a photo story of their investigation.

Whichever way your children choose to share their findings, it is important to ask the children to consider what their audience needs to know.

So, ask them:

- What was your initial question?
- How did you set about investigating your question and what did you find out?
- Did you have any surprising or unexpected results?
- Were you able to answer your initial question or is there more investigating to be done?
- Were there any challenges that you overcame or new questions that popped up as you worked?
- If you did your investigation again, how might you improve what you did?

Info on Science Sharing

Who's involved?	How long have you got for your Great Science Share for Schools?		
	Half an hour	**Half a day**	**Half a term**
My own class	Invite another class to visit your classroom before school, at lunchtime or after school. Challenge the children to have a science investigation they can share, e.g. identifying and classifying sweets, observing plans with a hand lens or testing materials etc.	Invite families into your class for 'Bring a parent to school afternoon'. Children lead the science investigations. Go out for a science walk…map a trail around the local area and seek out science as you go. Use a theme like plants, materials, and forces to focus attention.	Identify a pupil planning to delegate jobs, e.g. inviting the VIPs, organising the resources, and trialling investigations. Encourage them to promote the GSS by storyboarding and filming adverts, explaining what this is about and the range of science investigations and processes that could be used. Use QR codes in school newsletters to allow parents to watch.
The whole school	On the specified campaign day launch with a science assembly. Young people could be encouraged to dress up as a Science Hero. Focus the week on reading science books as part of a Great Science Big Read. They could post reviews on the #GreatSciShare twitter feed or on the school website. Design a poster to tell others about their favourite science question!	Host a science investigation carousel in each classroom, letting classes of children move around the school to experience science in different ways. Choose a theme or topic to bring it together, or simply allow free reign. Have a science afternoon, where children are tasked to create a Science Exhibition in a key space so visitors can see their questions and ideas.	Ask each class to hold an assembly about a famous scientist over the period of the 6-week term. Each class to host lunchtime Science Pop up, showcas-ing their most engaging science investigation. Develop an area dedicated to science in your school library and showcase this to others on the Great Science Share for Schools day.
Another school, e.g. a high school	Host a Great Science quiz. Pupils devise a quiz sheet based on investigations they love to challenge their high school peers. Email your children's investigation ideas to your partner high school to get feedback and suggestions as to how they can work well scientifically.	Host a science investigation carousel in the high school. Primary pupils take their investigations to the high school and showcase them to older students. Spit the afternoon where high school students showcase to them.	Invite the high school staff to visit your school with ex-pupils on a week-by-week basis, working from Early Years to Year 6. Create a display board about the questions the staff and pupils raised, identifying scientific vocabulary and techniques, the high school may cherry pick in their own practice. Do the same the other way round to share learning.
A local business industry	Ask the children to compile a list of questions that they could ask a scientist or engineering working in those locations. Tweet or email them to a local technology company and ask them if they could respond.	Task the young people to research and invite a local company or STEM Ambassador to come school for the afternoon. Ask them to take part in an introduction as-sembly to give a short talk about themselves and explain how they use scientific enquiry in their everyday jobs.	Invite representatives from a local company to be a VIP at your Great Science Share. Ask them to work with the children beforehand to develop a science investigation using equipment or kit from their workplace.

Courtesy of the Great Science Share for Schools – to find more useful information visit www.greatscienceshare.org

Related links:

For more guidance on child led enquiry take a look the guide available on our website.

Your children can choose the most important parts of their investigation to present. They may wish to accompany a written response with models or by demonstrating their investigation practically. Encourage your children to talk about their investigations with other people. This could be with your class, or another class in your school. It could be in a science share held with other schools in your area or cluster, or with other schools in your town.

See 'Great Science Share for Schools' PDF for some ideas on how you might organise your own science share day. A science share is a 'children to children' event, where your children share outcomes of their investigations with other children. The ideas in the PDF have been shared by teachers, they are not an exhaustive list of all the opportunities you could do. The sky's the limit - do whatever will best suit the children that you work with using the time and resources you have available.

We hope that this investigation in the Terrific Scientific campaign will be a real opportunity for child led enquiry, that your children will increase their independence as decision makers – seeking answers to their scientific questions through practical enquiry. We realise that every learning situation is different; some children will be used to making choices as they work, however some children will need more scaffolding and support.

Glossary

Investigation	A science investigation is where a question is answered by following a systematic process of enquiry. In primary science there are five enquiry types: Identify and Classify, Pattern seeking, Research (using secondary sources), Observations over time, Fair and Comparative testing.
Prediction	A prediction is made when the children state what they think is going to happen before they carry out their investigation. They can use their prior learning or pre-existing data to support their rationale. A group of children may come up with a number of different predications can be made before an investigation – this is OK. The important thing is that the children can justify their prediction and explain their thinking. At the end of an investigation it is important to return to the prediction to see if it was correct or not.
Variable	A factor that could be controlled or changed as part of an experiment.
Independent variable	An independent variable is the one variable that is being investigated. e.g. Which seed is eaten by the greatest number of birds? The Independent Variable is the seed. We will test three different types of seed – sunflower, corn and millet.
Categoric variable	A categoric variable take on values that are names or labels. The data can be sorted into groups and counted. See also discrete data.
Dependent variable	A dependent variable is the variable being measured or observed, to see how it responds to how the independent variable is changed. E.g.: Which seed is eaten by the greatest number of birds. The dependent variable is the number of birds. How many birds feed from each type of seed?
Constant variable	Constant variables are all the factors that are controlled and kept constant throughout a fair or comparative test. Otherwise they will affect the results of the test. E.g.: Which seed is eaten by the greatest number of birds. The constant variables include: same amount of each food, put out at the same time each day, in the same position in the garden, by the same person.
Measure	To find the amount or size of something.
Continuous data	Continuous data is a variable that can take any value on a continuum. For example, how tall does a sunflower grow over a month? The height of the sunflower is continuous data. You can use continuous data to calculate other values. Continuous data can be recorded either on a histogram or a line graph. On a histogram the bars are touching to show that they are related.
Discrete data	Discrete means separate. When data is discrete, each variable is a separate entity e.g. eye colour, how you travel to school, and types of material. Discrete data is normally recorded on a block graph or bar chart. There should be gaps between the bars to show that data is discrete.

Evaluating evidence	Once evidence has been gathered, children need to consider if their evidence is reliable. If they have collect information from books or the internet, they need to consider if the source of that information was reliable - was that information factually correct or was it an opinion? If they have collected measurements, children need to consider if their measurements were accurate or not and whether enough evidence was gathered.
Conclusion	To draw a conclusion is to make a judgement based on the evidence you have gathered. A conclusion includes a summary of whether any patterns were spotted in the data; plus, an explanation of the findings using appropriately scientific language.

A conclusion should include:

- An explanation of whether there were any patterns in the data and give examples from the data which demonstrates the pattern.
- Explain the science behind the findings using appropriate scientific language.
- Refer back to any predictions: acknowledging whether the prediction right or wrong, explain why this is the case.
- Evaluate the investigation: Were the measurements accurate? How could the investigation be improved?