Why&How? Magazine

Summer 2022: Issue 15

CELEBRATING 25 years 1997 - 2022 SUPPORTING PRIMARY SCIENCE

New FREE Resources for: science enquiry, inclusion, and early years

Underwater: Learning about living and non-living things

Supporting excellent teaching and learning in primary science
Why & How? is the magazine of the Primary Science Teaching Trust

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Why & How? is the brand name of the Primary Science Teaching Trust

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25 Years of PSTT!

We are delighted to be celebrating 25 years of PSTT. Martin Pollard, our new CEO, reflects on the past 25 years and looks forward to PSTT's future.

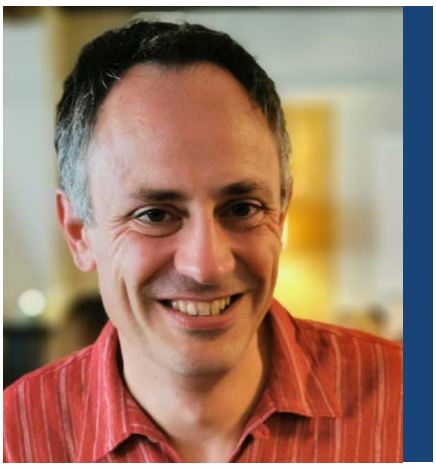
When PSTT was founded in 1997, the world looked very different. We were amazed by the birth of Dolly, the world's first cloned adult mammal. The internet was still in its infancy, and the Mars Pathfinder became the first robot to operate beyond the Moon. Climate change action and awareness were an afterthought for much of the world, despite five years having passed since the Kyoto Protocol on greenhouse gas emissions.

I qualified as a teacher during this period. While 'chalk and talk' teaching methods were already ancient history for many, the technology was not much further advanced (although we did have whiteboards). We still wrote on overhead transparency sheets and the whole school shared a very small number of chugging tower computers.

Yet despite the incredibly rapid social and technological changes of this quarter century, some things remain constant. Children are curious, hungry for knowledge and eager to experiment. Great teachers know how to inspire excitement and engagement in science, with or without expensive equipment at their disposal. And we need to remain vigilant to ensure that these opportunities are available to all children, whatever their background or abilities.

Over the past 25 years, PSTT has invested more than £24 million in supporting teachers to do all of this. We've established our College of over 200 inspiring science leaders, supported academics to do key research and development projects, worked with teachers and partners to produce numerous science resources, and helped establish strong communities of practice throughout the UK.

Later this year, I'll be working with the PSTT team to develop a new strategy for the next 5 years and beyond. We'll set out clearly how we plan to meet present and future challenges, in education and the wider world. We can only do this because of our strong foundations in the teaching community, laid since 1997. Many thanks to everyone who has played their part in our achievements so far.



Martin Pollard, CEO

In this issue...

In this issue we have our regular **picture for talk**, a host of updates about what's new in **Explorify**, and a chance to find out more about how air pollution affects the scent of flowers in our latest **I bet you didn't know** article.

We have three new FREE resources to tell you about. Created by PSTT Fellows, **Bringing Back Glass** is an exciting collection of activities to support children to explore the properties, uses and benefits of glass through science enquiry. **TAPS Early Years** outlines the principles of developmentally appropriate practice in early science; with multiple exemplars from early years settings, it is a must-have guide for all early years practitioners. We are also pleased to be sharing a new resource for special educational needs and disabilities (SEND). Our **Inclusive Approaches to Primary Science** guidance booklet is the culmination of the PSTT-funded Primary Science for All project led by Sheffield Hallam University. Whether in mainstream or special schools, teachers of children with SEND will find these practical and effective approaches facilitate better access to learning in science.

In the **climate science** section, PSTT Fellow Nicola Bolton shares what she is doing in her school to encourage practical climate action across the school community, and how this is giving children more agency in addressing the climate challenge.

In **It's not the activity that counts: it's the learning**, PSTT Regional Mentor, Kate Redhead, outlines how recent research findings have shaped her approach to supporting schools with improving their primary science provision. Using the example of a school in the West Midlands, she describes the impact this is beginning to have on both teachers and children.

We are delighted to spotlight the **Association for Science Education** (ASE) in this issue and to find out more about their wide range of support for primary science including CPD opportunities, events, publications and resources. Also in **wider collaborations** we highlight our new **Primary Science Enhancement Award** (PSEA) for Initial Teacher Education. Note that the closing date for registration of interest to take part in the scheme for next academic year is **very soon - 25th May 2022**. It is also not too late to sign up for the **Great Science Share for Schools**: a fantastic opportunity for children to take part in a huge UK-wide primary science event.

This is the 15th issue of our magazine. We hope that over the last five years it has been a useful source of practical support and updates about PSTT projects and research.

We value feedback from our readers. Please do continue to keep us posted about what you find most useful and interesting in our magazine, and keep sharing it with anyone else who would like to receive free resources, classroom support, and PSTT updates.

Martin Pollard
Chief Executive Officer

Dr. Sophie Franklin
Research Director

Peter Sainsbury
Cluster Director

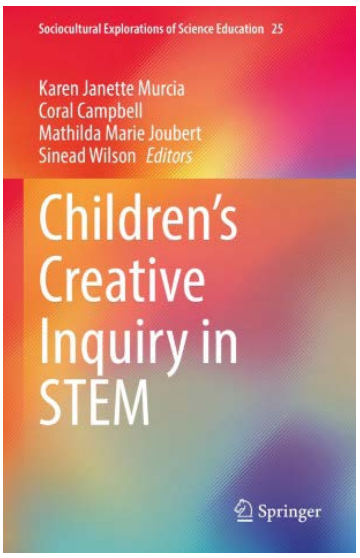
Ali Eley
Outreach Director

Sue Martin
Programme Director

News

Children's Creative Enquiry in STEM

PSTT Fellow Debbie Myers has written a **chapter**, 'Leonardo da Vinci's Apprentices or Tinkering Belles and Boys at Ludic Play?' for the newly published book, Creative Enquiry in STEM. The book is part of Springer's series, 'Sociocultural Explorations of Science Education' and can be found **here**. Other contributors to the book include PSTT Fellow Clarysly Deller, and PSTT collaborators Deb McGregor, Sarah Frodsham, Lynne Bianchi and Sarah Earle.



Award for Cath Milne

The PSTT is excited to share the news that our College Fellow Cath Milne was awarded one of the the ERA Foundation David Clark Prizes 2022 at a ceremony held at the Institute of Engineering and Technology, London, on 17th May 2022.

The ERA Foundation was established as a non-profit organisation in 1920 to support UK engineering, innovation and skills development programmes. It awards two David Clark Prizes each year, one for teachers in primary schools and one for teachers in secondary schools, colleges and university technical colleges.

The prize "recognises exceptional teachers who have gone the extra mile in inspiring young people to consider engineering as a profession and career, celebrating those that have gone beyond what is required in the syllabus by inspiring students and showcasing real world engineering in the classroom."

Cath, who teaches the P5 class at Avoch Primary School in the Highlands of Scotland, has received a personal prize in addition to an award of £12,000 for the school to use to promote engineering further. Cath's class has also been recognised in several competitions recently,including a prize of £500 book vouchers awarded for the creation of a video about their experience of judging the Royal Society Young People's Book Prize, and another prize from the Scottish Council for Development and Industry.

Cath clearly has a passion for bringing science and engineering to life for her children and for creating numerous opportunities for them in these areas of the curriculum. We would like to add PSTT's congratulations to Cath to those of the ERA Foundation.

Read Cath's citation from the ERA Foundation here.

ERA FOUNDATION

Science on Stage

The PSTT was delighted that five College Fellows submitted successful projects to represent the UK's primary delegation at Science on Stage 2022.

Although some could not attend due to the challenges of the pandemic, Rebecca Riley, Jules Pottle, Sarah Eames and Emma Crisell did manage to travel to Prague. They were accompanied by PSTT Regional Mentor, Kulvinder Johal, a Science on Stage Ambassador and part of the UK's National Steering Committee, to share their innovative ideas with over 350 delegates from more than 30 countries in attendance.

Rebecca encouraged children to "step into stories and become real scientists" as she challenged them to complete STEM activities alongside their favourite book characters. Jules shared "Doffa's Reindeer", a story she created to help children explore factual science and the nature of air pollution, something they are unable to see or touch (the book being illustrated by another PSTT Fellow, Rufus Thomas). Sarah had undertaken a joint project with a colleague from a school in Slovenia that she had met at the previous Science on Stage event. Their project focused on a question that Charles Darwin had explored: 'How many earthworks are below my feet?'

Emma's project, entitled 'Food for the 21st Century - Making a Difference', enabled her primary children to work collaboratively with local sixth formers, STEM professionals and members of the community to focus on three sustainable development goals: zero hunger, good health and wellbeing, and climate action. The children explored whether it was possible to grow food all year round at school. We were thrilled to hear that Emma's project was selected to win the Sustainable Goals in Education Prize at the event, and we congratulate Emma and the other staff and children at Richard Taylor CE Primary School in Harrogate on the success of their project.

Climate science

Take The Plastic Pledge!

Children at Heswall Primary School learning about ocean life with Incredible Ocean's inflatable whale

PSTT Fellow Nicola Bolton
is the science subject leader
at Heswall Primary School

Heswall Primary School's creative approach to the climate challenge.

Teaching about climate change should inspire children to make achievable, positive sustainable life choices – but how can we do this creatively in the classroom? Nicky Bolton describes #heswalloceanblue – 'Take the Plastic Pledge', - a creative environmental project that has taken place in her school, to raise awareness of the link between single-use plastics, and their negative impact on climate change.

How it began...

During the annual Eco School audit, the Eco Council were horrified to discover 29 single-use plastic bottles in use each day in Year 6. Following considerable research into the effects of plastic pollution and its consequences for climate change, the children decided to write a whole school 'Plastic Pledge'. This was a commitment to reduce the use of single-use plastic in school by making alternative sustainable choices. Every child in the school signed the pledge and from that moment, they were on a mission to spot anyone carelessly using single-use plastic!

Raising awareness of the Plastic Pledge

Children are proud to wear their Take the Plastic Pledge T-shirts

But the project didn't stop there. Keen to make a wider impact, the staff and children started to think of myriad ways in which they could inspire others to take the plastic pledge: their parents, the wider community and even their twin school in Uganda!

Creating a T-shirt campaign

One of the most successful ideas the children introduced was the #heswalloceanblue – 'Take the Plastic Pledge' T-shirt campaign. Since the beginning of the project, every child in the school has been given a T-shirt and every summer they are encouraged to wear it to inspire others to 'Take the Plastic Pledge'. We have since gathered photographs of the children spreading the message all over the world. We even have pictures of Dermot O'Leary and other celebrities wearing our T-shirts!

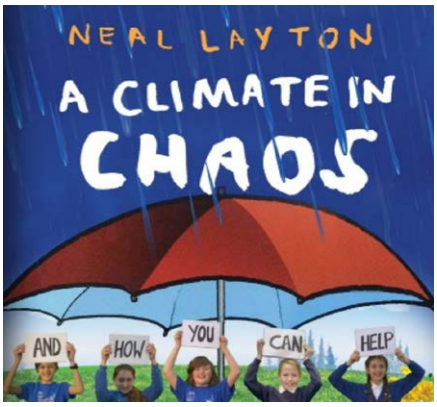
The power of film

As a school community, we have also explored film-making as a powerful way to elevate the understanding of the effects of plastic waste and its impact on climate change. Working in collaboration with other local schools and the amazing Impossible Arts film company, we have now produced several films which include:

'**A Planet Full of Plastic**'
(click link to view)

'A Climate in Chaos' (which premieres in July) inspired by the writer Neal Layton.

Working with film has given the children a brilliant opportunity to explore the issues of plastic waste and climate change through the media of acting, song and dance. We've even had a number of climate themed songs composed for us too.



Books and films offer powerful and creative ways to develop children's understanding of climate science issues

The school makes the most of themed days

Raising awareness in the community – themed days

There are many significant environmental days throughout the year, which remind children and the local community of ways in which they can help reduce their use of single-use plastics and protect their planet. Dressing up or having a theme on these days has helped our children to make the occasion especially memorable.

Events in March

Earth Hour encourages children to spend an hour without any power.

The Great British Spring Clean gives the whole school a purposeful opportunity to clean up the local environment.

Teams full of Wombles cleared the school's local area for the Great British Spring Clean!

Events in June

- World Environment Day
- World Oceans Day

These events both direct children to look at ways they can protect and improve the biodiversity on the planet.

Raising awareness in the community – themed days

A particularly successful venture for our project was our after-school 'Plastic Pledge community market'. This was an outdoor event which introduced parents to local groups, shops and organisations, who were keen to promote the reduction of single-use plastics. After the event, many of our parents started using the local milkman, and people were amazed by the wide range of sustainable shops and resources that were available right on their doorstep. This type of event is very simple and cost free to organise. Local organisations are only too happy to have the opportunity to network and share their services with families in the area.

The plastic pledge community market was very popular

The local dairy picked up many new customers at the market

Environmental role models

As a school, we have found using 'real life' environmental role models a powerful way to create real context for learning about environmental issues, plastic waste and climate change. During the launch of our #heswalloceanblue campaign, we spent time learning about microplastics with Russ Arnott from Incredible Oceans, explored plastic pollution with divers from the Blue Planet Aquarium, and examined evidence of the effects of plastics on marine life with Sarah Roberts, marine biologist and author of 'Someone Swallowed Stanley'. It is truly inspiring for children to listen to a passionate environmental expert; as a consequence many children will choose to make positive and sustainable changes to their own lifestyles.

The environmentalist Sarah Robert's visit was an inspiration for the children

Seeking global partnerships to gain a deeper understanding of climate change

School twinning programmes help children to understand how climate change is affecting the life of children in other parts of the world. As part of our project, we have worked collaboratively with schools in Uganda on environmental projects to highlight the effects of climate change and consider the impact of deforestation in the local rainforest. This has included tree planting, and building water harvesting systems on the edge of the Bwindi Rainforest.

Heswall has shared knowledge and worked collaboratively with their partner school in Uganda

The future of #heswalloceanblue

Our 'Take the Plastic Pledge' journey has gone from strength to strength, leading us to form alliances with a wide range of schools, environmental organisations, community members and professionals, both locally and globally. We are constantly looking for new and exciting ways to engage our children with the issues of plastic pollution and climate change. It is a project that will continue indefinitely, a theme which we consistently revisit, and most importantly, an environmental pledge that we hope every child from our school will carry with them to help them become considerate and responsible custodians of the future of our planet.

Some background information about plastic pollution and climate change

There are many ways in which we can change our lifestyles to diminish the output of greenhouse gases. But reducing use of single-use plastic is a tangible goal for children and one that they can achieve in their everyday lives. Plastic is a major contributor to the increase in greenhouse gases. To manufacture plastic, billions of tonnes of greenhouse gases are created. Recent figures show that we recycle just 43.8% of plastic packaging waste (WRAP, 2021). The remainder will be placed in landfill or incinerated, releasing more greenhouse gases into the atmosphere.

Discarded plastic also litters our oceans. Recent research has shown that this is having a devastating effect on the plankton in our ocean. Plankton absorb carbon dioxide which helps to reduce the carbon in the atmosphere. However, as plastic degrades in the sea, microplastics (microscopic pieces of broken-down plastic) are absorbed by the plankton. This prevents them from being able to absorb carbon dioxide, leading to an increase in the level of the greenhouse gases which contribute to global warming (Ford et al, 2022).

Useful organisations

- Eco Schools
- Impossible Arts (film makers)
- Incredible Oceans

References

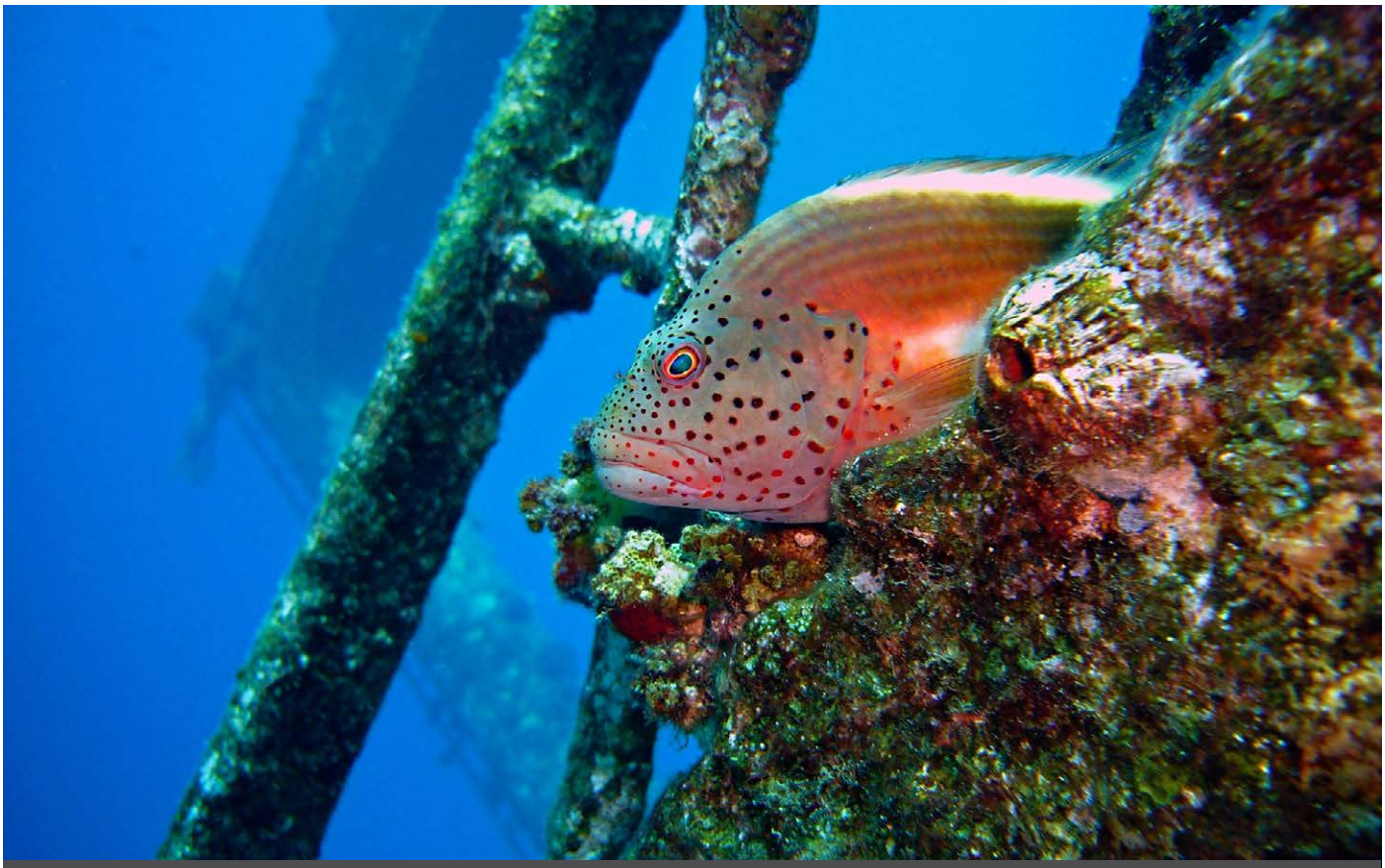
Ford, H., Jones, N, Davies, A., Godley, B., Jambeck, J., Napper, I., Suckling, C., Williams, G., Woodall, Koldewey,H. (2022) The fundamental links between climate change and marine plastic pollution. Science of The Total Environment Volume 806 (1).

WRAP (2021) Recycling Tracker Report 2021: Behaviours, attitudes and awareness around recycling https://wrap.org.uk/resources/report/recycling-tracker-report-2021-behaviours-attitudes-and-awareness-around-recycling.

Nicola Bolton is a PSTT Fellow and the deputy headteacher at Heswall Primary Teacher in the Wirral.

Free resources

Picture for talk



Click to download image

Fig. 1

A picture can be a very good stimulus for children to engage in effective talk in science.

Using pictures is an inclusive approach which facilitates high levels of participation. Pictures can also be used as a starting point for enquiry. The discussions the children have will generate questions that they want to investigate.

Asking the children carefully chosen questions about the picture will support them with learning to:

- Construct explanations and link their ideas with evidence
- Make confident challenges to the ideas of others
- Explore scientific terminology and use it with genuine understanding

Pictures for talk in science activities are designed to be very open ended and usable with children of any age. The activities can be done as a quick ten-minute starter, or extended into a longer and more in-depth lesson.

What to do

Download the image in fig.1 by following the link and either display on a whiteboard or give out printed copies. Ask the children to discuss, in groups of three, the following questions:

What can you see in the picture that is living?

What can you see in the picture that is non-living?

What can you see in the picture that is natural?

Can you find anything in the picture that is made by humans?

Click to download image

Fig. 2

Other questions to generate and promote thinking and explaining

- Do you think that a material can be both natural and human-made?
- Why do you think the metal is in the water?
- How do you think the metal has changed since entering the water?
- What changes might occur over time to other things you can see in the picture?
- What do the living things need to survive?
- Can you think of benefits to placing materials into the sea that would not usually be found there? What might be the issues?

Natural materials come from animals, plants and from the ground. Materials from the ground include stones, metals and minerals, including the salt dissolved in the water, along with others such as soil or clay. Materials that can be extracted from these are sometimes considered to be natural too, but human intervention may be required to turn them into usable materials.

For example, an animal skin needs to be processed to become leather – the leather is considered by some to be a natural material whilst others argue that it is human-made. Cotton must be spun by a human-made machine to create the threads necessary to produce clothing – but the material is not changed in any other way.

Steel is made from two natural materials – iron and carbon. However, these materials need to undergo a reaction in order to produce the steel, which has different properties to iron; it is harder and stronger. Therefore steel is human-made.

Iron or steel may also be introduced to the ocean to support structures – as seen in the image. Some creatures can live on the structures and a new habitat may form, supporting numerous living things. Artificial reefs are sometimes built specifically to create habitats for marine life, and these may be made by sinking objects such as old oil rigs or be purpose built from PVC (plastic) or concrete.

Through a process called 'iron fertilisation', iron is sometimes introduced to oceans to encourage the growth of phytoplankton, microscopic organisms that can photosynthesise (make their own food) and so form the base of many food chains in the oceans. Scientists do not all agree on whether iron fertilisation is a good thing to do. Some scientists argue to the phytoplankton take up carbon (from carbon dioxide) and take this to the ocean floor, removing it from the atmosphere. As increasing carbon dioxide in the atmosphere is a major cause of climate change, this process could be beneficial. Others argue that there may be unintended consequences of introducing too much iron to the oceans.

Download the image in fig. 2 and ask the children to discuss:

- What similarities and differences can you see in this image compared to figure 1?
- How do you think the fish survive in the fish tank when the plants are all artificial?

Free resources

Bringing Back Glass

Following the United Nations declaration that 2022 would be the International Year of Glass, the PSTT has worked with The Worshipful Company of Glass Sellers of London to develop resources for primary science.

Children are likely to be very familiar with glass in their everyday lives. From windows to mirrors, glassware to television and mobile phone screens, we are surrounded by glass. However, they may not be aware of the importance of glass for other less visible uses, e.g. for optical fibres that transmit huge volumes of data around the world, for supplying power where metals cannot be used, and for the transmission of light through medical equipment such as endoscopes.

So what are the benefits of using glass in the classroom?

- Glass is made from naturally occurring materials that are abundant
- Glass is readily available, reusable and completely recyclable
- Glass is inert, non-toxic, and impermeable, so when cleaned it will not harbour any harmful chemicals from its previous use

Glass marbles are great for investigating protecting Arctic ice from heat

Creating a glass musical instrument

Bringing Back Glass includes **15 activities** designed to support the delivery of engaging science lessons. They enable children from 3-11 years to explore the **properties, uses and benefits of glass** and to engage in meaningful and relevant investigative science.

The activities cover a wide range of primary science topics, including:

- Materials & their suitability for different purposes
- Light
- Sound
- Plant germination & growth
- Soil
- Water cycle
- Animal adaptation (birds)
- Habitats (the Arctic)

Download the resource booklet here

Possible learning outcomes for each activity have been linked to the UK primary curricula so that educators can see where an activity might fit into their planning.

Download the UK curricula links here

Visit the **Bringing Back Glass** webpage for further supporting information, including the relevant background science and common misconceptions children may have about the concepts encountered in the activities.

Observing objects in greater detail

Download the background science and common misconceptions here

All activities have been written by PSTT College Fellows.

Free resources

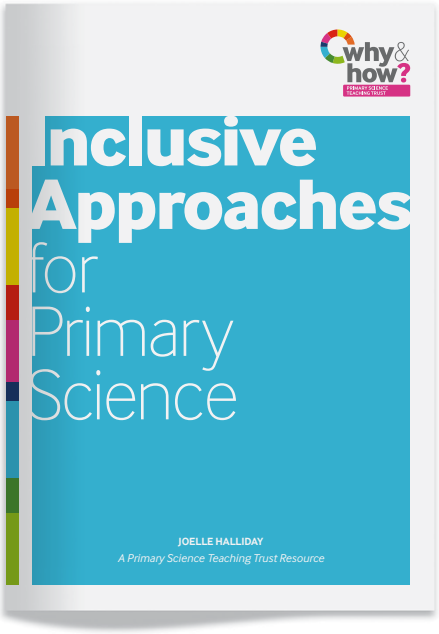
Inclusion in Primary Science

Our new webpage 'Inclusion in Primary Science' brings together brand new and existing resources for supporting children with special educational needs and disabilities (SEND) to make progress with primary science.

Following the PSTT-funded two year curriculum development project, **Primary Science for All**, colleagues at Sheffield Hallam University have produced a guidance booklet – **Inclusive Approaches for Primary Science** – to support teachers of children with SEND. The project included a group of participant teachers and teaching assistants from a mixture of primary school settings including special schools, pupil referral units attached to mainstream schools, and mainstream schools. All had a commitment to improving the inclusivity of primary science so that lessons would be accessible to all learners. Project participants focussed on developing two key inclusive approaches: **Wonder Cupboards and Frames**.

Inclusive Approaches for Primary Science describes:

- The background to the project and the resource
- Examples of how to use Wonder Cupboards and Frames
- How to use these two inclusive approaches in combination
- Real stories from educators about their experience with each key approach



Download the Inclusive Approaches For Primary Science guidance booklet here

The PSTT website inclusion page also contains:

- information and links to all the STRATA (Science to Raise and Track Achievement) materials, including medium term plans for teachers of children with SEND
- Sensory Sparks Club resources: activities for children with diverse needs, created by PSTT Fellow and SEND expert Julie Neil
- Further resources: links to other materials to support engagement and participation of children with SEND in science

PSTT works closely with The Lightyear Foundation who improve access for children with SEND to STEM activities and careers.

Sensory Spark club cards – a set of nine activity cards, designed for children with diverse needs to enjoy and make progress in their science learning

Explorify

What's new?

The Explorify team at PSTT has been busy! The Explorify website is packed with new activities, Helpful Reads, and our series of science topic planning support videos.

New Activities

Explorify's collection of new Odd One Out activities cover all age groups and a range of topics, including **Wonderful women in science**, which highlights the achievements of three brilliant women scientists. Odd One Out activities are designed to promote talk and higher order thinking in the classroom and provide a great formative or summative assessment tool. You can use them to find out what children already know or to assess what they have learnt further into a topic. All of the activities for younger children will work just as well with older children.

We have upgraded the notes to go with the activities. In the background science we have added a **Watch out for** section which flags up children's common misconceptions. The **Take it further** sections have been strengthened to give more ideas about how to use the activity to develop scientific enquiry in the classroom. For example, **What is inside flowers?** looks at reproduction in flowering plants and suggests how you can dissect flowers and reveal the different parts, as well as how you can use drama to help the children understand pollination.

We have expanded the range of concepts covered in different topics. For example, under the topic of Forces, we have the brand new **Making work easier** which compares three different **pulleys**.

Odd One Out: Making work easier

Odd One Out: Adapted to eat ants

There are three new activities for Adaptation and Evolution. **Adapted to eat ants** compares three fascinating mammals which all eat ants or termites. Found in different parts of the world, similar adaptations have evolved in each of the species, enabling each one to survive in its own habitat. **Fantastic foxes** has two different images of an Arctic fox, one in winter and another in summer, as well as the familiar red fox. Children could then research fox adaptations, or those of another animal. **The drinks menu** shows three very different animals, two of which have adapted to change ice, snow or water vapour into liquid water that they can drink.

Odd One Out: The drinks menu

To find out more about Explorify's newest Odd One Out activities, have a look at this **four minute read**. For guidance about how to run an Odd One Out in the classroom, have look at this **blog**.

Please note: to view these linked activities, you will need to be registered with Explorify. Sign up here for FREE.

Making maths meaningful with Explorify

Helpful Reads for Science Leads

Where might an unplanned Explorify journey lead?

What do you do if you have a spare fifteen minutes with your class? Instead of games or tidying up or an extra moment to read, what about diving into an Explorify activity? You could follow suggestions from the children or build up your own stack of Explorify favourites on the 'My dashboard' page ready to dip into later. If you are unsure about what to pick, you can always go for one of the suggestions given on your Explorify homepage.

In this **Helpful Read**, Robin James describes how a more playful, ad hoc, adventurous approach to Explorify can reap unexpected rewards.

Preparing for Ofsted

As science is a core subject, many schools are reporting that it is one of the subjects commonly chosen by Inspectors in England to examine in detail. This is known as a "deep dive". If you are the Science Subject Leader at your school, you should expect a deep dive when Ofsted visit, and there are things you can do to prepare for this.

In this **Helpful Read**, Jo Moore shares her recent experience of an Ofsted inspection at her school. She describes what happened over the course of the inspection and some of the questions she was asked as a science subject leader – about the school's science curriculum, and about progression in both substantive and disciplinary knowledge. At the end, Jo gives her five top tips for subject leaders to ensure they are prepared in advance of the school getting "the call".

Make maths meaningful with Explorify

Find out how Explorify activities can provide great contexts for developing and applying maths skills. In this **Helpful Read**, Robin James picks out a collection of activities that give children opportunities for estimating, weighing, measuring distance, counting, and identifying shapes.

Top 10 Tips for new Science Leaders

This **Helpful Read** has been updated and is a great starting point for anyone taking on the leadership of primary science.

Coming soon!

We are about to launch a brand new category of activities, '**Have you ever?**'

Due to be published in June 2022, these activities are designed to make children the experts by relating their everyday experiences to science learning. Based on the principles of the **Primary Science Capital Teaching Approach**, the aim is to get children talking about simple experiences and encourage them to see themselves as science experts with a valuable contribution to make.

A sneak preview of two of the Have you ever? activities

Have you ever heard your neighbours watching TV?

Have you ever noticed a plant growing in cracks in the pavement?

If you haven't yet registered for Explorify, SIGN UP FOR FREE HERE!

Free Explorify Planning Support Videos

Would you like support finding just the right Explorify activities to enhance your science planning? Join an Explorify Engagement Leader in one or more of our free, short, friendly sessions to find out what new activities we have and how these can support science teaching in your classroom and across your school. You will also be provided with a handy downloadable planning document. The sessions are a great way for science subject leaders to support all staff who teach science.

The planning support sessions are:

- Suitable for all classroom teachers
- Relevant to all four UK curricula
- Based around topics and ages of children
- 30 minutes in length – we know you're busy

You can book to join a live session where you will have the opportunity to ask questions and find out more from the Explorify Engagement Leader running the session. If you cannot attend live, don't worry as all the sessions are recorded and you can access them at any time. **Click here** to see the list of upcoming live sessions and the list of recorded sessions. We are gradually building up the collection – watch this space as we plan to cover all curriculum topics before too long!

Keep in Touch!

Let us know what you think about what's new at Explorify as it will help us as we create more great activities and supporting materials for CPD. Contact us using Twitter, Instagram or our Facebook staffroom.

I bet you didn't know

Floral scents may be changed by air pollutants

Dr. Alison Trew,
PSTT Website Resources Developer
and Area Mentor

E: alison.trew@pstt.org.uk

Insect pollination of crops is important for farming and food production. However, scientists are concerned that increased air pollution changes the sweet smells (floral scents) that flowers make to attract insects.

Figure 1.A: A garden bumblebee (Bombus hortorum) visiting the common toadflax which has petals that form long tubes. B: A red-tailed bumblebee (Bombus lapidarius) on Irish fleabane. © Ivar Leidus, licensed through Creative Commons and accessed via Figure 1.A and Figure 1.B.

The scientists carried out experiments to see whether insects were attracted to floral scents mixed with pollutants.

Which types of flowers do insects prefer?

Insects visit flowers to feed on their nectar (a sugary liquid produced by the flower) and pollen to survive and grow. Most pollinating insects (pollinators) have preferred types of flowers that they visit and may have specific adaptations to enable them to collect pollen and nectar efficiently.

For example, the garden bumblebee has a particularly long tube-like mouthpart (proboscis) that it uses to suck up the nectar from the base of the flower. It can reach deep within a flower so it can visit flowers with petals that form long tubes. The red-tailed bumblebee is a larger bee that likes to land on flowers with platforms, such as daisies (Figure 1).

Children could carry out surveys in the school grounds or local parks to answer these questions:

- Can you identify the insects that visit the flowers in your local environment?
- Do different types of insects visit the same flower?
- What shape are the flowers that the insects visit?
- Are some coloured flowers more popular than others?

How does an insect find nectar?

Many insects rely on the sweet smells produced by flowers (floral scents) to guide them, whilst others recognise brightly coloured petals or patterns on petals. The effectiveness of floral scents to attract insects depends on the surrounding environment.

Why are scientists concerned?

Human activities such as burning fossil fuels have dramatically increased levels of pollutants released into the atmosphere. Increasing air pollution might reduce the attractiveness of the floral scents because some of these pollutants react easily with the natural substances (scents) released by flowers. This could change the floral scent.

Questions to discuss:

- What might happen to populations of moths, butterflies and other pollinators if they cannot locate flowers easily?
- What other living things do you think might be affected if insects cannot find their flowers? Why?

In a recent paper, Brynn Cook and his colleagues showed that ozone (a pollutant gas found in the air) altered the blend of substances in a floral scent. They compared how the tobacco hawkmoth (Figure 2) responded to one of its preferred floral scents and what happened when the scent was altered by adding ozone.

To find out which scent the moths preferred, the scientists put the moths in a wind tunnel with two artificial flowers, one flower with the natural scent and one with the altered scent. They observed which scent the moths flew towards (Figure 3). This experiment showed that hawkmoths prefer the natural scent over the ozone-altered floral scent.

Figure 2. A male tobacco hawkmoth (Manduca sexta).

© Kugamazog, licensed by Creative Commons and accessed here.

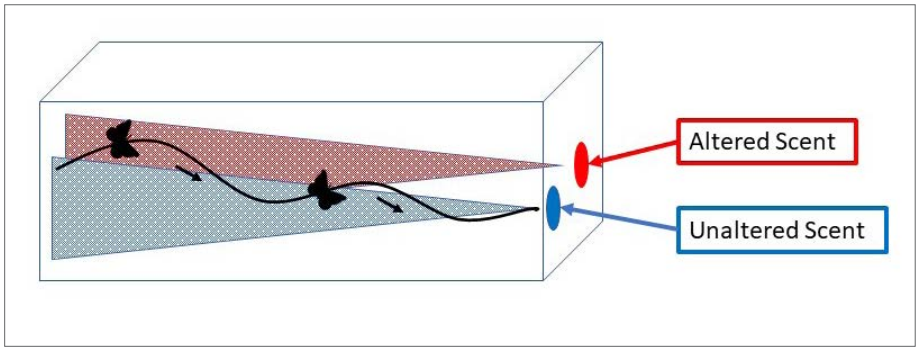


Figure 3. Hawkmoths choice test in a wind tunnel between two tubes emitting either unaltered or ozone-altered floral scents.

In a second investigation, to see whether the moths could learn to recognise a new scent, the moths were exposed to the altered scent (the one they did not prefer) and at the same time were given a sugar-reward on a visually attractive flower. When they were re-tested in the wind tunnel, the hawkmoths spent more time at the altered scent – they had learned that the altered scent gave a reward and were therefore more attracted to it.

In nature, the floral scent is altered as it travels away from the source flower and through a polluted atmosphere. Foraging moths will experience greater quantities of altered scent when they are more distant from the plant and increasing natural scent as they move close to it to collect the nectar. The scientists simulated this in the laboratory. The moths preferred the ozone-altered floral scent to air after training with a sugar reward in three different situations: with the ozone-altered scent, with the natural scent, and after a sequence of scents (ozone-altered then natural). The scientists suggest that foraging moths could learn to recognise polluted scents, but they are yet to test whether this is the case in the natural environment.

How will pollinators and flowers evolve in the future?

If an animal and plant depend on one another for their mutual survival, the link between them must be maintained. In an increasingly polluted environment, the plants that survive might be the ones whose pollinating insects learn to recognise altered floral scents. If insects cannot adapt to the modified scentscape, they may be unable to locate their food and populations of both insects and plants might be endangered.

It will be interesting to see whether, over the course of many generations, flowers evolve, through natural selection, to be more brightly coloured, have patterns on their sepals and petals to guide their pollinators to them, or use some other method to attract their pollinators. More work is needed to find out the real threat of pollutants on foraging insects.

The Teacher Guide that accompanies this article suggests how children could investigate how a particularly volatile smell affects their ability to smell other fragrances. They could also investigate which colours and patterns on petals are the best for catching the attention of passing insects.

To find out more about air quality, air pollutants and climate change, you may be interested in PSTT's Air Pollution Research resources for children (ages 9-11).

For teaching ideas and classroom resources to support climate science, teachers may be interested in PSTT's recorded sessions from the Primary Climate Science Symposium and articles from Why & How? magazine, which can both be accessed here.

Glossary

adaptations – characteristics of living things that improve their chances of surviving and reproducing

air pollution – the contamination of the air by a mix of particles and gases that can be harmful to human health and the environment

foraging – searching for food in the wild

fossil fuels – a natural fuel formed in the past from the remains of living organisms that contains carbon and hydrogen that can be burned for energy, such as coal, crude oil or gas

natural selection – the process in which organisms better adapted to their environment survive and pass on their beneficial characteristics to their offspring

ozone – a colourless gas, made of three oxygen atoms bound together, that forms in the air when other pollutant gases (nitrogen oxides and volatile organic compounds) react in sunlight. Even at low levels it is harmful to humans

pollination – the transfer of pollen from the male part of the flower (anther) to the female part of the flower (stigma)

pollinator – an animal that moves pollen from the male anther of a flower to the female stigma of a flower. Examples include insects such as bees, butterflies, moths and beetles and also vertebrates such as birds, some small mammals and reptiles

pollutants – harmful materials that are released into the environment and damage the quality of the air, water and land

scentscape – the complex composition of smells in an environment

simulated – in science or industry, a method that copies actual events or processes under test conditions

The research paper that inspired this work was:

Pollination in the Anthropocene: a Moth Can Learn Ozone-Altered Floral Blends

By Brynn Cook1,2, Alexander Haverkamp1,3, Bill S. Hansson1, T'ai Roulston2, Manuel Lerdau4 and Markus Knaden1

Published in Journal of Chemical Ecology (2020) 46:987–996

https://doi.org/10.1007/s10886-020-01211-4
Last accessed 23.5.22

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3. *Present address: Laboratory of Entomology, Wageningen University, Wageningen, The Netherlands*
4. *Departments of Environmental Sciences and of Biology, University of Virginia, Charlottesville, VA, USA*

It's not the activity that counts: it's the learning

Kate Redhead,
PSTT Regional Mentor
for the West Midlands
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Kate Redhead, PSTT Regional Mentor for the West Midlands, describes how recent research findings have shaped her approach to supporting schools with improving their primary science provision.

As a Regional Mentor for the PSTT, my role is incredibly varied. Based in the West Midlands, my aim is to reach out and support the teaching of science in schools in the area, from light touch weekly newsletters informing science leaders of opportunities, to tailored approaches, specific to the needs of a particular school which develop over time.

In this article, I explain how I have worked with a school in the West Midlands to support teachers to reflect more deeply about why the learning is important rather than focus on how they will approach it. This helps to put key learning at the core of teachers' science planning.

Background

Whittaker and Poole (2021) highlighted that 'fun' science activities experienced by children often do not lead to meaningful learning. Their report found that children can recount the exciting moments and activities completed in science, but struggle to identify or consolidate learning. They concluded that this is partly due to a misunderstanding by teachers of the purpose of practical work, with activities being selected on the basis of ensuring participation and enjoyment, rather than on the intended sequence of learning. In their subsequent Research Review into Science, Ofsted also describes how 'pupils regularly experience 'fun activities' without developing a deep understanding of the associated scientific concepts' (Ofsted, 2021).

This issue, identified by both inspectors and academics, has led to a strong focus in schools on what is termed 'essential/key learning' or 'critical content'. This is hardly surprising given the experience of schools over the last two years, but what do these terms actually mean and how can schools best support their children in accessing them?

What we did

In Summer 2021, I began working with Moat Farm Juniors, a school eager to improve their science through a whole school approach.

> "We want to empower our teachers to get excited about teaching science so that our kids are inspired"

This statement came from the school's Deputy, so immediately it was clear the senior team were keen to drive change, and along with the science subject leader, we were able to plan out an approach for the year.

A group approach to classifying living things through labelling and manipulating Lego pieces

Starting points

Our plan developed over time and was tailored to the specific needs of the school. Throughout the process we ensured that each step taken followed the most up-to-date evidence documented in the 10 Key Issues report (Bianchi et al, 2021) and the Ofsted Research Review for Science (2021). Since starting the work with Moat Farm Juniors, further guidance to support teachers to interpret and apply the findings in the Ofsted review has been published by the Primary Science Quality Mark, in collaboration with the University of Manchester and the Association for Science Education. This response (Turner et al, 2022) is designed for teachers, senior leaders and professionals in primary science, and aims to stimulate reflection on current practice and to help identify next steps.

Download a copy of A response to the Ofsted Review for Science: Guidance for primary schools' here

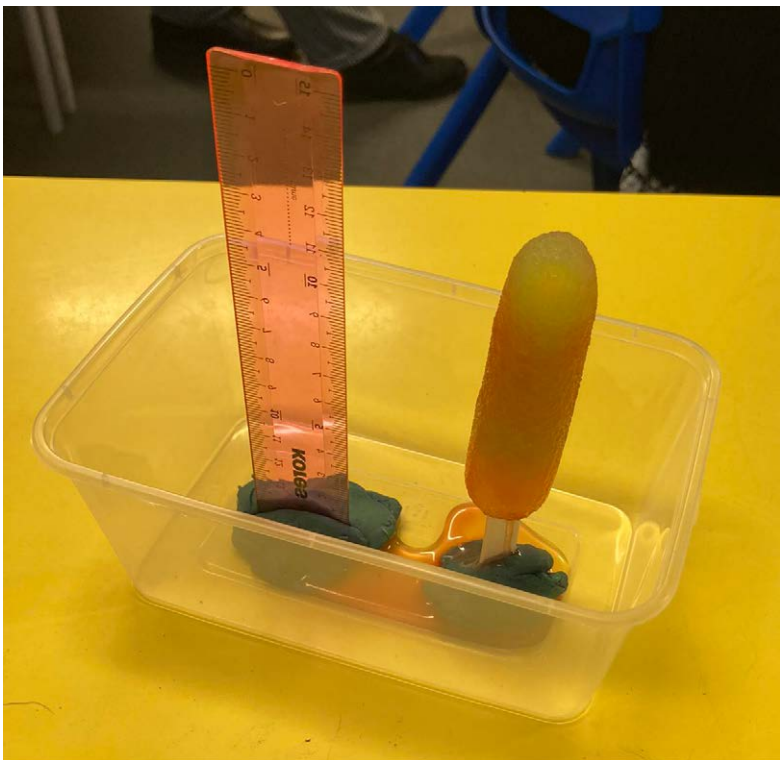
Whilst Moat Farm Juniors' journey began before it was published, this guidance provides a clear framework for describing the steps we have taken in moving science forward across the school, hence the headings used for the next sections are aligned to the issues that emerged in the guidance.

1. Subject leadership and developing teacher expertise in science is a necessity

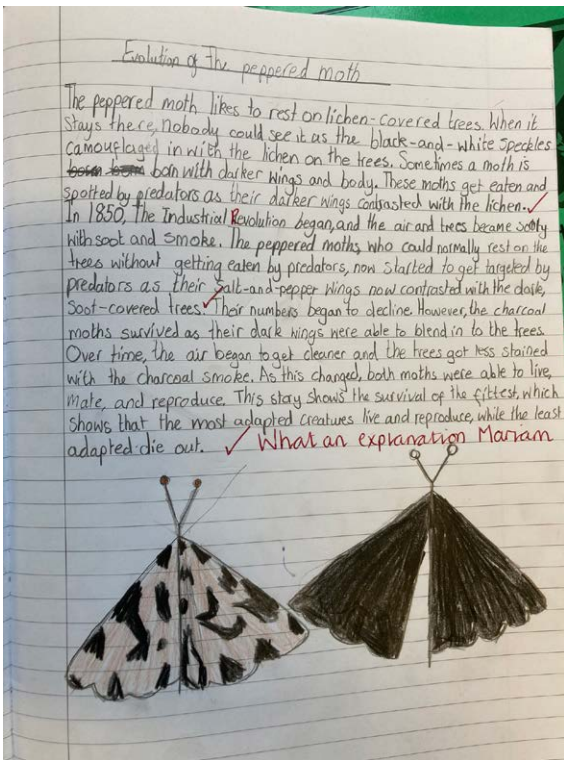
With science on the school improvement plan, action planning for the year was a necessity in establishing the intention; the why. Where was science and where did it need to get to? Important in this was taking a realistic approach with targets that ensured a balance of input against time to implement, for both the science leader and teachers. The Ofsted Inspection Framework underlines the importance of school leaders taking 'into account the workload and well-being of their staff, while also developing and strengthening the quality of the workforce', something that is reassuringly backed up by anecdotal reports of inspectors clarifying this point with both leaders and teachers in school visits.

We began with exploring how to develop expertise across the staff body, recognising the good practice already in place and using this as a platform on which to build. After time in the summer term working alongside the science leader, the new academic year began with a whole staff training session to both share this vision and raise enthusiasm, with science curriculum pointers and pedagogy strategies. This was added to across the year with topic specific workshops for each year group. This was a huge commitment from the whole staff team and a superb way of building teacher expertise and subject knowledge.

Building on prior knowledge of changes of state to make a model of the water cycle in a bag



Consolidation of learning about changes of state and developing measuring skills through focussed observation of an ice lolly melting next to a ruler



Evolution of the peppered moth

The peppered moth likes to rest on lichen-covered trees. When it stays there, nobody could see it as the black-and-white speckles camouflaged in with the lichen on the trees. Sometimes a moth is ~~born born~~ born with darker wings and body. These moths get eaten and spotted by predators as their darker wings contrasted with the lichen. ✓ In 1850, The Industrial Revolution began, and the air and trees became sooty with soot and smoke. The peppered moths who could normally rest on the trees without getting eaten by predators, now started to get targeted by predators as their salt-and-pepper wings now contrasted with the dark, soot-covered trees. ✓ Their numbers began to decline. However, the charcoal moths survived as their dark wings were able to blend in to the trees. Over time, the air began to get cleaner and the trees got less stained with the charcoal smoke. As this changed, both moths were able to live, mate, and reproduce. This story shows the survival of the fittest, which shows that the most adapted creatures live and reproduce, while the least adapted die out. ✓ What an explanation Mariam

Example of an independent piece of writing in Year 6

These workshops gave an excellent opportunity to reflect on the 'essential learning' of each topic, giving time to consider:

- The National Curriculum statements for each topic
- How they build on prior learning
- How they link to other topics
- The common misconceptions to look out for
- How to establish whether there are gaps in learning and how to address them
- Links between topics and across the curriculum
- Any school-specific learning points (e.g. which plants and trees are in the local area)

Underpinning each session was the recognition that this learning constitutes the why. This is the intention of the topic. In a recent 'staff voice', this focus on essential learning was highlighted by many teachers as most useful.

2. Expertise in science requires children to build substantive and disciplinary knowledge

Each workshop looked in detail at the substantive knowledge of the topic, while practical activities sought to consider how disciplinary knowledge could progress across year groups, recognising both areas of scientific enquiry and the skills of working scientifically. Activities were shared to explore how the learning couldbe developed. We ensured that discussions about **how** the learning was delivered always linked back to the **why** – the essential intended learning.

The regularity of these sessions has meant that they have been adapted over the year to cover different areas, for example recognising the links to English that can be made in how children communicate their findings.

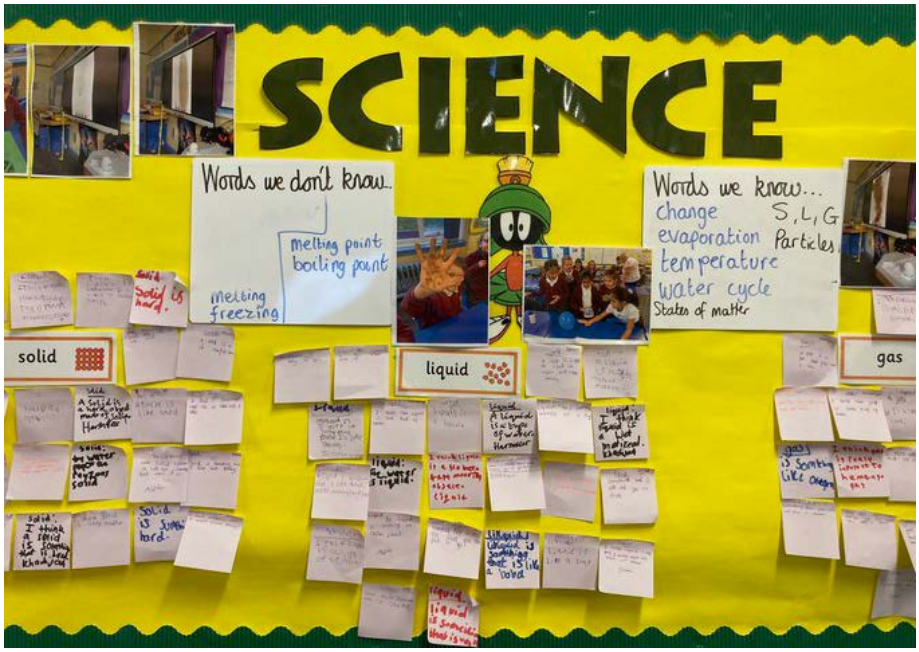
3. Improvement of children's science learning needs to be curriculum-led and sequenced

The science leader worked tirelessly on school planning pathways. These built on previous teaching and sought to cover and address misconceptions, locate and fill gaps, and allow progression of learning. This has been a particular challenge with topics which have had varied coverage over the last two years.

This approach ensured the development of knowledge and essential learning, as well as highlighting where topics could be better sequenced, leading to the adjustment of the topic order in the coming year.

4. Purposeful selection of a range of teaching approaches includes direct instruction and enquiry-based teaching

The learning pathways and workshops allowed different teaching approaches to be included and considered. These ranged from formative assessment strategies focussed on vocabulary, through teacher demonstrations to allow clarity and safety, to practical experiences both in and outside the classroom. With the time given to the science leader over the year, this also allowed for a clearer focus on enrichment activities and their ability to deepen understanding of key concepts when approached in a considered way.



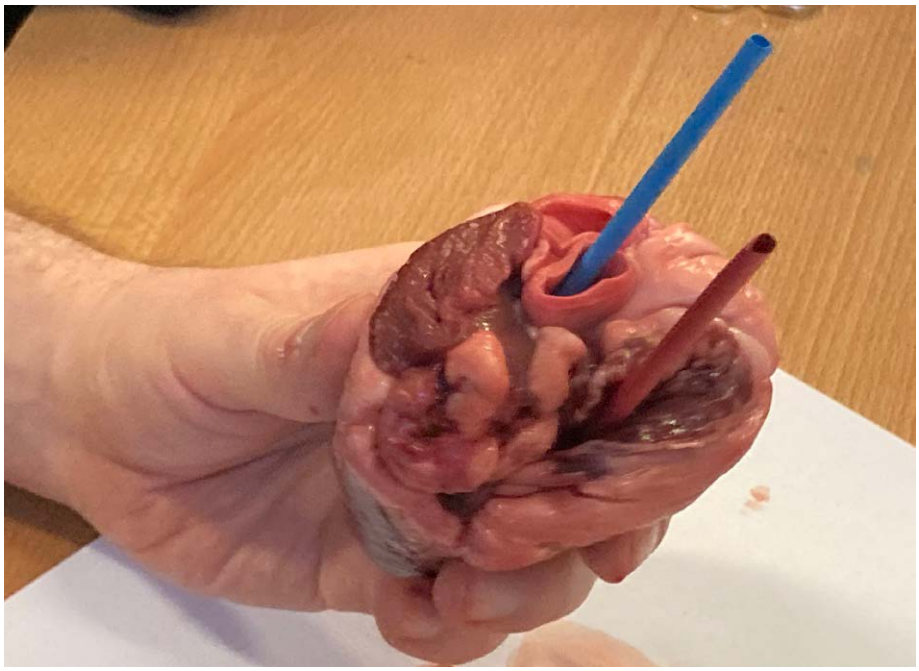
'Words we don't know' and 'words we know'. Children add statements on post-it notes to describe what they already know or have learned about solids, liquids and gases

5. Teachers need sufficient subject knowledge to assess effectively

A huge range of formative assessment strategies have been explored over the year, including concept cartoons, Explorify tools, matching games and more. One particularly useful tool, taken from the 10 Key Issues Report from the Science and Engineering Research and Innovation Hub (SEERIH), has been key in bringing children back to the learning; the why. At appropriate points, children are encouraged to reflect, by sharing with a partner or group what they have learnt. This reflection helped them identify what they had learned and why this is important, rather than focus on how they had learned, i.e. the activity they had done.

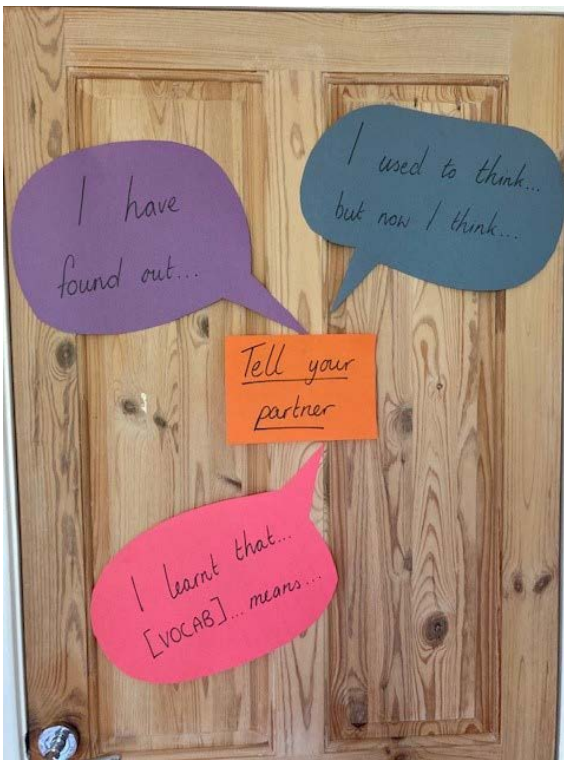
Whilst strategies are now well established for substantive knowledge, the assessment of disciplinary knowledge is in trial, with two out of the four year groups using **TAPS formative assessment** tasks in topics.

By the end of the year, this approach will be shared with the whole team along with summative approaches to support end of Key Stage assessments.



Consolidation of learning on the circulatory system through heart dissection activity

NB: for the latest guidance about the dissection of animal organs in the primary classroom, we recommend that you refer to CLEAPSS or SSERC



A 'Tell your partner' wall, encouraging children to share what they have learnt

TAPS formative assessment activity being trialled

Conclusion

So, is the work done?
Of course not!

Moat Farm Juniors are identifying the needs of their school and their children, and as leaders and educators we know there will always be improvements to make and more consistency to strive for. However, the impact of the hard work by the staff team is already being seen in the learning taking place in classes and in attitudes towards science. All staff now report feeling 'confident' or 'very confident' in teaching science and almost all state that children can reflect on the science learning, the why. Most teachers report having no 'least favourite' topic to teach and one teacher stated they 'loved them all'.

For me, it's the anecdotal reports each time I'm in school and seeing these change from comments like, 'The children loved...' or 'We had a great time with...' to comments like, 'The children linked their new learning to their ideas about ....' or 'The children wanted to explain what they think about ....'

Whilst some of what staff say might still be reports of the **how** (the activity), the new focus of the staff team on the **why** means that their approaches are much more designed to consolidate learning and deepen understanding, rather than being a series of one-off activities where the children only remember the fun.

References

Bianchi, L., Whittaker, C. and Poole, A. (2021) 'The 10 Key Issues with Children's Learning in Primary Science in England', The University of Manchester and The Ogden Trust.

Ofsted (2021) Research review series: science. London: HMSO.

Turner, J., Bianchi, L. & Earle, S. (2022) 'A response to the Ofsted Research Review: Guidance for primary schools', Primary Science Quality Mark, The University of Manchester and the Association for Science Education.

Collaborator update

Bath Spa University

BATH SPA UNIVERSITY

New TAPS Resource for Early Years

We are delighted to launch the latest in Bath Spa University's suite of supporting documents for Teacher Assessment in Primary Science (TAPS). The 'Early Science: guidance from the Teacher Assessment in Primary Science (TAPS)' booklet considers the underpinning principles for effective and developmentally appropriate practice in early science.

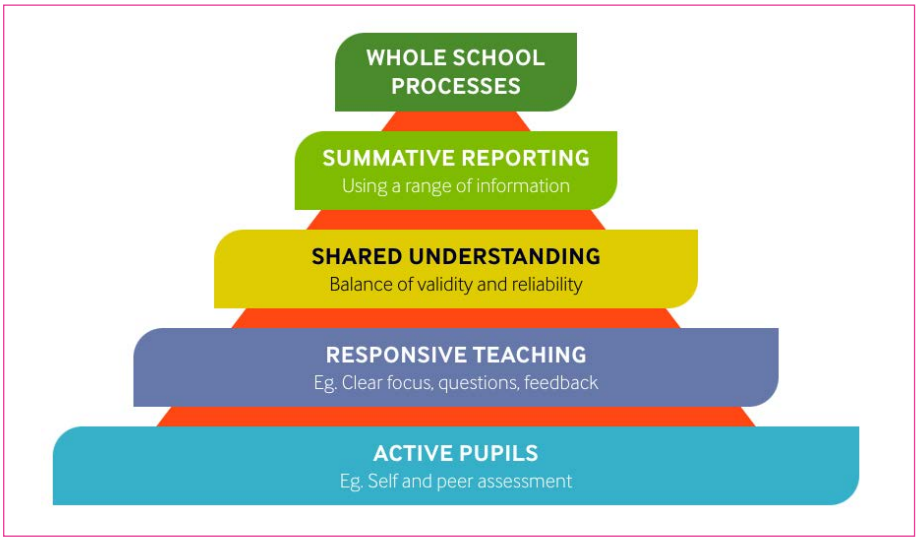
Although science might not be explicitly specified in early years curricula, young children's natural behaviour is often highly scientific; from birth, they are constantly exploring and enquiring to make sense of the world around them. The statutory guidance for England lists three characteristics of effective teaching and learning: 'playing and exploring; active learning; creating and thinking critically' (DfE, 2021: 16), all of which support the development of scientific skills. This new early years resource outlines the place of science in children's early education, highlights the value of play and exploration, and discusses the role of the adult. Illustrated with real examples from early years settings, the resource is a comprehensive guide to good primary science practice for all early years providers.

A summary of the research in early years science practice that underpinned the guidance booklet has been published in the Journal of Emergent Science, January 2022, issue 22. Click **here** to read this article.

TAPS is based at **Bath Spa University** and funded by the Primary Science Teaching Trust. TAPS aims to develop a valid, reliable and manageable system of primary school science assessment which will have a positive impact on children's learning.

Download the Early Science Guidance Booklet Here

Early exploration through water play



The TAPS pyramid tool

Further information about the Teacher Assessment in Primary Science (TAPS) project

The TAPS pyramid tool provides a structure to help schools evaluate and develop their assessment processes. The rich formative assessment information collected by teachers in the course of ongoing classroom work is also utilised for summative purposes – the orange arrow represents information flowing up the pyramid. Schools should begin with a focus on the 'Pupil Layer' and the 'Teacher Layer' at the base of the pyramid. These foundations encapsulate the principles of Assessment for Learning and this is where changes will have the most impact on pupil progress in Primary Science.

The **pyramid website** is designed to be a supportive source of examples – by clicking on each box you will be taken to examples from a range of schools. It can also provide a structure to support school self-evaluation.

If you would like to offer further examples, or provide the TAPS team with feedback, please email: primary.science@bathspa.ac.uk.

Keep up-to-date with TAPS developments on Twitter by following @PriSciEarle.

Wider collaborations

Initial Teacher Education

The Primary Science Teaching Trust has developed the Primary Science Enhancement Award (PSEA) scheme for Initial Teacher Education. The PSEA scheme enables student teachers to engage in reflective practice and development in primary science, beyond the statutory content of their initial teacher education phase.

The scheme draws on rationales, processes and resources developed by the Primary Science Teaching Trust, the Primary Science Quality Mark, and Stranmillis College, Belfast. It has been piloted over the last two academic years, and from September 2022, it will be open to student teachers from any UK ITE provider who has registered for their organisation to take part. It is suitable for PGCE students, for final year undergraduate students, and for students going into teaching through school-based routes.

The PSEA for ITE scheme is supported by the **Association for Science Education**, the **Primary Science Quality Mark** and **The Ogden Trust**.

AIMS OF THE PSEA FOR ITE SCHEME

For Initial Teacher Education providers:

- To have access to a scheme to enhance their support for trainee teachers in science
- To stay up to date with primary science education developments through engaging with PSTT and our wider collaborators

For trainee teachers:

- To start their careers with increased competence and confidence to teach science
- To be confident to take up a position of school leadership in science

HOW THE PSEA SCHEME FOR ITE WORKS

At the start of the scheme, in consultation with their ITE tutor, the student identifies their intended outcomes and devises their own programme of reflective activity and a timeline for this.

The ITE provider will be responsible for agreeing any internal timelines for the students and any additional support given is at their discretion. PSTT will make all relevant information, supporting documents and key dates available on the PSTT website. The student is responsible for producing a portfolio of evidence, which is signed off by the student's own ITE tutor before they submit it to PSTT through the website. The award will be made at one level, i.e. the standard has been reached or not reached, and a certificate will be issued by PSTT to all students whose portfolios meet the standard. An anonymised exemplar of a completed portfolio that met the standard is available **here**. The purpose of the certificate is to verify that the student completed the scheme and has engaged with PSTT, the Primary Science Quality Mark (PSQM) and the Association for Science Education (ASE) and the logos of these three organisations are included on the certificate.

For further details. please visit the PSTT **webpage,** where you can watch videos of student teachers talking about their experience of taking part in the PSEA scheme. You can also download the PSEA information flyer **here.**

How to take part in the PSEA for ITE scheme next academic year 2022/23

Registration must be made by the **tutor** at an initial teacher education provider by completing the form at the bottom of the PSTT webpage by **25th May 2022 at the latest.**

Please note that the form is for **tutors only**; students should not be completing it. Students who take part will register to do so through their initial teacher education provider at the start of the autumn term 2022.

All tutors who register interest through this form will be invited to an online information meeting. There are two options for this: Tuesday 7th June 2022 at 10.00 am and or Monday 13th June 2022 at 4.30 pm. Attendance on one of these dates will be compulsory for any tutor who wants to start the scheme this academic year, but attending the information meeting does not then oblige any institution to take part. Following the information meeting, all tutors wanting to go ahead with the scheme must confirm with PSTT by 15th July 2022. All tutors who have confirmed will then be invited to an online 'getting started' meeting in September 2022 – dates to be confirmed but there will be two options. Again, attendance at this meeting will be compulsory.

PSTT very much hopes you and your organisation will want to engage with this scheme and looks forward to seeing you at one of the information meetings in June.

PLEASE DON'T FORGET TO REGISTER YOUR INTEREST TO TAKE PART IN THE PSEA SCHEME FOR ITE BY 25TH MAY 2022!

Wider collaborations

The Association for Science Education (ASE)

The Association for Science Education

With a proud history going back more than 100 years, the Association for Science Education is a professional family of teachers, trainees, technicians, consultants and academics united by a common goal: promoting excellence in science education.

Now more than ever, teachers need all the support they can get, and as one of the UK's largest subject associations, our sole reason for existing is to give our members exactly that support... with a particular focus on supporting primary science.

As anyone involved in the education sector will be more than aware, the challenges facing schools over the past 18 months have been particularly acute, and in this article we'll share what we as an organisation have been doing to support both our members and the science education community at large – as well as sharing details on a brand new primary-facing project of which we are particularly proud...

Speaking with one voice

At the ASE we believe that there is a particular need to raise the profile of primary science in the UK, with an engaging, creative and appropriate curriculum and greater support for primary schools to develop science leadership, teaching and learning. In addition to the direct support we provide to our members, one of ASE's key roles is to advocate with policy-makers and implementors, providing a critical conduit through which educators can represent their views to those in power.

ASE members have opportunities to feed into this work through surveys and focus groups, with our expert committees often taking a leading role in our consultation responses and Best Practice Guidance documents. We also support our community to translate policy developments into practice. A recent example can be found in A response to the Ofsted Research Review for Science, a guidance document for primary schools created in collaboration with the Primary Science Quality Mark and the University of Manchester's Science and Engineering Education Research and Innovation Hub (SEERIH). Launched in late March 2022, the document has already made a significant impact – attracting more than 600 sign-ups to the launch webinar, and 1250-plus downloads, and being welcomed by Jasper Green HMI, Science Lead for Ofsted.

Resources and books

The resources available to our members broadly fall into two categories: practical assets that can be deployed and adapted directly in the classroom, and guides/development tools to support science teaching more broadly.

In the former category, the ever-popular PLAN resources provide an expansive collection of assets to help schools plan and assess primary science effectively, while our recently launched Mary Anning Project (see page 34) has already had a huge impact.

For the latter, our recently updated (and member only) Primary Science Leaders' Survival Guide is an essential 'how to' for new and experienced science leaders alike, featuring practical advice from fellow professionals on all aspects of delivering science in primary schools.

We also have a thriving publishing arm – Millgate – which boasts an ever-growing range of specialist science education books and resources. From long-established primary classroom favourites such as Concept Cartoons, It's Not Fair – Or Is It? and Be Safe, to the newly published Saving The Planet One Science Lesson At A Time and (the award-winning) Superhero Scientists, the Millgate online store – at which members are entitled to substantial discounts on many resources – provides a valuable collection for all primary science educators.

The ASE offers a range of different membership options – tailored for everyone from trainees to full institutional packages. Find out more here.

"Global crises such as the Covid-19 pandemic and climate change highlight both the need for a strong future pipeline of scientists and engineers, as well as scientific literacy for all. Raising the profile of primary science is crucial to achieving these goals and our work with partner organisations such as PSTT is a key part of this, allowing us to maximise the support we provide across the primary science community."

HANNAH RUSSELL,
ASE Chief Executive

"A large proportion of ASE members are primary schools, teachers, CPD leaders and ITE tutors. Primary members are active and collegiate. I encourage all teachers of primary science to join ASE to benefit from the primary specific resources, support and events ASE provides, and to share in the advantages of membership – a way for your voice to be heard on important policy issues, and opportunities to develop your career through presenting at events, contributing to journals and participating in committees."

JANE TURNER,
ASE Current Chair

Save the Date!

ASE Annual Conference
5th - 7th January 2023
Sheffield Hallam University

2023 Conference themes:

- Assessment
- Curriculum
- Diversity
- Professional Journeys
- Research
- Sustainability and Environmental Issues

ASE resource spotlight

Scene from the Sea Dragon film

Key Moments in History and Science – A Fossil Hunter's Story, is a multi-disciplinary approach to fossils and evolution for 9 to 11-year-olds, involving teaching and learning resources, and professional learning strategies, for teachers to support children's understanding of the big ideas of fossils and evolution, the nature of scientific enquiry and the strengths and limitations of scientific knowledge.

These free-to-access resources were developed in response to concerns from many primary teachers about their lack of confidence and experience in teaching evolution and inheritance (new to the National Curriculum in England in 2014), and their concerns about the lack of suitable teaching resources to engage children.

The story of the fossil hunter Mary Anning and her amazing discoveries provides the context which brings to life one of the most exciting and revolutionary periods in the history of science. Our internationally recognised Sea Dragon short film sets the scene for our enquiry-based activities through which children explore the lives, ideas and events in the early 19th century that were significant in the development of scientific ideas and thinking.

Our immersive resources – a series of nine core and six enrichment activities – are presented through an interactive pdf. Each activity includes key questions, curriculum links and vocabulary, what children do and learn, classroom resources, background information and professional learning strategies for teachers. The activities are designed to be used flexibly, mainly in science lessons but in some cases also in history, religious education, and English.

The activities support the use of dialogic teaching, in which children express and share their ideas in group or whole class discussion and teachers encourage children to explain their thinking. The enquiry-based approach emphasises the role in learning of the identification of questions, and the collection and use of evidence in seeking answers.

All feedback has been extremely positive from the perspectives of both teachers and their children, including children from disadvantaged backgrounds and those generally less engaged with science.

Key Moments in History and Science – A Fossil Hunter's Story was developed through a grant from Big Questions in Classrooms, an initiative of the Templeton World Charity Foundation. Find out more here.

The Sea Dragon film

What teachers say about using 'A Fossil Hunter's Story'

"You were learning lots of things in one subject. By putting it together it was easier to remember all the things together rather than learning about them separately."

"I loved the fact that this project inspired and engaged not only children but also the staff. As a science leader, this was excellent CPD for my team."

"I liked how did we history and RE along with science – I preferred it to the other science topics we have done. I really liked how it combines."

"We honestly feel that all children in each session made good progress regardless of their starting points. This project pulled out children who had gone under the radar and really made them stand out. Some of our SEND children have made better progress in this than they had done all year."

Wider collaborations

It's time to step up your science with the Great Science Share for Schools 2022

Great Science Share for SCHOOLS

Are you...

- looking for ways to help your pupils to see themselves as scientists?
- focusing on progression of pupils' working scientifically skills across your school?
- looking for ways to collaborate across your school and with your wider community?

If so, take part in this year's **Great Science Share for Schools, Tuesday 14 June 2022**.

The Great Science Share for Schools is an award-winning campaign that **invites 5-14 year olds to share their own scientific questions and investigations, to raise the profile of science in schools and communities, and to be inspired into science and engineering**.

Your pupils can share their questions, methods and findings with new audiences in so many different ways. You could arrange a sharing event in your own classroom or school hall or even between groups of schools in a large-scale community event.

Join the celebration!

Step one is register your school, it's quick, free and easy. Once registered, you will have full access to a wide range of resources to support you in planning your Great Science Share, however big or small that might be.

Questions, Questions, Questions!

Asking questions is one of the most natural things to do, but asking great scientific questions is a bit of an art and takes some practice. You can try the Great Science Share for Schools **Question Makers** as a creative and fun way to focus in on your pupils' question asking.

Looking for inspiration?

The **Great Science Ideas** are a collection of resources, grouped by pupil age range, to inspire pupils to ask their own scientific questions about the world around them.

Child-led investigating

Once children have asked their own scientific questions, they can plan and carry out investigations to help them answer the questions.

Why not try the **Great Science Skills Starters?** Direct-to-classroom videos that **model scientific skills**, provide an opportunity for **pupils to practise the skill** and finally challenge them to **apply the skill** when carrying out their own enquiries.

The **SHARE** is what the Great Science Share for Schools is all about, it provides an opportunity for children to see themselves as scientists. There are many different ways for your children to share their scientific questions, enquiries and findings on 14 June 2022. Take a look at the website for inspiration!

Register now for your pupils to part of this amazing celebration of young scientists. Find out more here.

Key dates

25 MAY 2022

Deadline for ITE providers to register interest for the Primary Science Enhancement Award scheme for next year

14 JUNE 2022

The Great Science Share for Schools

15 JULY 2022

Deadline for nominating a teacher for a Primary Science Teacher Award

5-7 JANUARY 2023

ASE conference in Sheffield

sharing
&learning

excitement
&exploration

discovery
&delight

investigating
&questioning

www.pstt.org.uk

The Primary Science Teaching Trust (formerly the AstraZeneca Science Teaching Trust) was fully endowed with a grant from AstraZeneca PLC

why & how?
PRIMARY SCIENCE TEACHING TRUST

Why & How? is the brand name of the **Primary Science Teaching Trust**
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