Why&How? Magazine

Autumn 2023: Issue 19

Explorify: new activities linking science and art

Connect children with nature through storytelling and adventure

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

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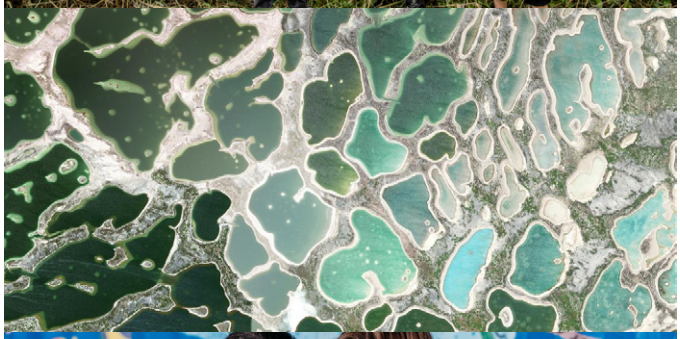

Why & How? is the brand name of the Primary Science Teaching Trust

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Welcome

Welcome to this issue of the Primary Science Teaching Trust's termly magazine, Why and How? In this issue we have our regular features, including **resources** where we highlight PSTT's **Playground Science**, in **Initial Teacher Education** we celebrate the Primary Science Enhancement Award, and we share a number of **key dates** for your diary.

In **news** we are delighted to share PSTT's new strategy with details of how we are evolving and refining our approach. It is an exciting time of development for PSTT. In the coming months, there will be more information on our new direction: we outline what you can expect to hear about from us and how science in your setting could benefit.

In our latest **Climate Science** article, Mark Stead, Head of Learning at the Wildfowl and Wetlands Trust, shares their Generation Wild project which focuses on developing nature connection with children from disadvantaged backgrounds. He shares how you can get involved along with providing links to further resources to support the development of nature connection.

Explorify has expanded its bank of activities and we are delighted to share the launch of two new activities: Start with Art and What Just Happened? Start with Art is a series of activities which bring science and art together, celebrating curiosity and creativity. What Just Happened? activities are short videos for children aged three to five. Each video shows a change over time which is likely to be familiar to the children; however, the activities are designed to encourage observation and discussion.

This issue's **Picture for Talk** uses an intriguing image which has the potential to stimulate talk around time, and the Earth and space topic. There are also many links between science and geography to explore. The suggested questions could be used to support the development of higher-order thinking skills in your classroom. In the **I bet you didn't know** article, the work of Jean-Francois Bastin and colleagues is highlighted. This research explores the potential for tree restoration and planting schemes to limit some of the impacts of climate change.

Why & How? is now celebrating its 19th issue and a run of 6 years so far! In this time, we hope that it has been a source of practical support and useful updates about PSTT projects and research. As PSTT begins implementing the new strategy, we would like to hear from you, our valued readers. We would like to know how you are using Why & How? and what you would like to see in future issues.

Please spare a few moments to fill in our **questionnaire** and for the **chance to win one of two £50 vouchers** for the Ethical Superstore. Complete the questionnaire by the 5th November so you don't miss out on the prize draw!

Please do keep sharing Why & How? with anyone who would like to receive free resources, classroom guidance, and updates from PSTT and other organisations who support primary science.

Primary Science Teaching Trust

News

PSTT Launches New Strategy

At the start of September, the Primary Science Teaching Trust adopted a new strategy for the next 5 years. Our vision remains the same: in the long term, we want to see excellent science teaching in every primary classroom in the UK. What we are introducing is a more refined, more focused programme to move towards that vision.

As a charity, we have continued to evolve and refine our focus. Established in 1997 as the AstraZeneca Science Teaching Trust, we were initially a grant-making trust, concentrating on funding other organisations to innovate in the field. For some years we also invested in work at Key Stage 3. Between 2010 and 2012, we turned our attention exclusively to primary, renaming ourselves the Primary Science Teaching Trust.

During the past decade, we have had a wide-angled strategy. Through the excellent work of the Primary Science Teacher College, we've built a network of award-winning Fellows with whom we have developed numerous projects, resources, and events to support primary educators across the UK. We have funded clusters of local schools, and we've launched a Regional Mentor programme to provide advice and training to teachers. Through a series of partnerships, we have funded and supported initiatives like Teacher Assessment in Primary Science, Thinking Doing Talking Science, the Primary Science Quality Mark, the Primary Cluster Programme at SSERC and the Primary Science Capital Teaching Approach.

In 2023, it is time to harness everything we have developed and to:

- **Refine our approach** – be clearer about what "excellence in primary science teaching" means, and use this knowledge in all we do
- **Target our efforts** – give our most intensive support to schools and teachers that need the most development, and embed equity and social justice in our work
- **Focus on impact** – be more rigorous about evidence, improve how we measure the effects of what we do, and keep learning how to improve

To do this, we have put in place a new operational structure for PSTT together with a refreshed **staff team**. We are dividing our work into a National Programme and a Regional Programme, each with its own director. Connecting these two programmes are the vital cross-cutting elements of research and development, impact evaluation, and communications about our work.

The idea is that we will create a virtuous circle for our charity: by focusing on what works, our activities will become more impactful; that impact will lead to more partnerships and funding for our work; that in turn will make PSTT more financially sustainable, so that we can continue to benefit teachers and learners well into the future.

So, what PSTT activities can you expect to hear about in the months ahead? We will be:

- Developing a 'core offer', comprising the essential elements schools need to work towards excellence in primary science – this will form the backbone for everything we do with schools in future
- Identifying priority areas – initially three pilot localities, where we will provide intensive support to help schools develop their science provision
- Refining our CPD offer and developing a new programme of open-access CPD courses, to be offered both online and face-to-face
- Evolving our Regional Mentor programme, which gives science leaders and their schools access to bespoke mentoring and support
- Focusing more on our provision for student and early career teachers, including a roll-out of our Primary Science Enhancement Award

Through all of this work, we will continue growing the College to support us to reach wider audiences, and to strengthen primary science networks.

I look forward to sharing more news about these developments. In the meantime, I hope that all our readers have a happy and successful school year.

Martin Pollard, CEO

Climate Science

Generation Wild: Connecting disadvantaged children with nature through storytelling and adventure

Generation Wild is the Wildfowl and Wetlands Trust's (WWT) free nature connection project for primary schools, children and families in economically disadvantaged areas.

Why was the project developed?

WWT believe that nature is for everyone, not just the privileged few. The benefits of nature connection, particularly for children, are now well known. It can increase achievement and improve mental wellbeing, making young people feel happier, increasing their self-confidence and reducing stress and anxiety[1]. Children from economically disadvantaged areas potentially have the most to gain. However, evidence shows that children from these communities are much less likely to connect with nature than their more affluent counterparts[2].

Our approach

Discussions with teachers, children and parents from these communities revealed that many feel that nature is not for them. They worry that they won't fit in, don't have all the right equipment and clothing and don't know the names of all the animals.

Many teachers, parents and carers missed out on these opportunities as a child. As a result, they feel uncomfortable in natural environments[3] and may lack the skills and confidence to provide nature-based experiences for their children[4].

Generation Wild shows that nature connection is for everyone. The activities are incredibly simple, don't require any equipment and can be completed in almost any outdoor space.

Why nature connection?

Generation Wild is based on the five pathways to nature connection identified by the University of Derby[5]. Traditionally, our learning programmes have taken a largely knowledge and facts-based approach. We now believe that it's not enough to simply learn about nature. If people are to come to truly love and protect the natural world, they need to experience it directly. They need to connect on an emotional level[6]. Research shows that environmental knowledge accounts for just 2% of the variance in behaviour towards nature whilst nature connection accounts for 69%[7].

Research shows that direct experience of nature and connecting on an emotional level leads to a love of the natural world.

How does it work?

The project is based around the story of Ava the bird girl. Children are introduced to her through a digital storybook. They meet her (in life-size puppet form) at our wetland centres and follow her journey back at home and at school. She challenges children to complete nature activities in order to become 'Guardians of the Wild' and receive their certificates and membership badges in assembly.

Ava, who is part-osprey, part-human, greets the children as they arrive for their visit.

What impact has the project had?

To date (end August 2023) 28,000 children have taken part. They have completed 72,000 nature activities in school grounds, gardens and local green and blue spaces.

Research carried out by Cardiff University shows that the project has increased levels of nature connection, the amount of time spent outdoors and children's sense of responsibility towards nature, whilst decreasing negative feelings linked to wellbeing.

Teachers reported a range of behaviour and wellbeing benefits. A big part of this was the changes seen in children with behavioural or emotional difficulties.

> "He was one of the children with the most severe behavioural difficulties I've ever seen in seventeen years... but he would sit and he would build this bug hotel beautifully, and even make little beds to put in it, in case they wanted to go to sleep... you know, and so for a child who... he's incredibly difficult... and you know, he doesn't show emotions. Well, he's showing a lot of empathy!"

Many children referred to moments of calm that they don't often get in their lives. Nature provided a space to escape the stresses and strains of everyday life as well as providing opportunities to slow down and reflect.

> "It got my brain working, while it keeps me calm on another level, distracting me from my bad thoughts."

It has given the children a sense of freedom, fun and happiness and many talked about how carrying out the activities has made them feel good about themselves.

> "I liked how live and free I felt whilst rolling on the field."
>
> "It gave me a moment to just feel happy."
>
> "It made my heart feel good inside."

It's helped children to appreciate the wonder and beauty of nature and provided real moments of magic, awe and wonder.

> "It was so overwhelming for me. It was magical."

Most importantly, it's made them feel part of nature where before many felt separate from it. They've come to appreciate its importance and many have overcome a fear of creatures that they now love but would previously have tried to destroy.

> "It felt like nature is close."

For some, this has led to a sense of kinship with nature. They've come to see other creatures and even plants as their friends. One of the activities was to make friends with a tree by experiencing it with all of your senses. For some children, this tree has developed a special meaning for them and a special place in their lives. It's become somewhere to go when they are feeling lonely, something that is always there for them; something that makes them feel safe.

Through the Generation Wild activities, children develop a sense that they are nature, helping them appreciate even the smallest creatures.

What's next?

The project is now entering its third year. If you know a school that would like to take part, they can see if they're eligible and book onto the programme **here**. Please see the full list of wetland centres at the end of the article.

Not within travelling distance of a WWT centre?

Don't worry, we still have plenty to offer.

Our Generation Wild activities are available to all teachers and can be accessed on the Generation Wild website **here**. Just scroll to the bottom of the page and you'll find a link to all 54 activities.

We also have a range of teacher resources on our Learning Zone website.

These include curriculum resource packs covering key science and geography topics as well as practical 'make-it' activities that can be carried out in your school grounds.

Generation Wild runs across seven WWT wetland centres in the UK:

Arundel Wetland Centre, West Sussex, BN18 9PB

Castle Espie Wetland Centre, Co Down, N Ireland, BT23 6EA

Llanelli Wetland Centre, Carmarthenshire, SA14 9SH

London Wetland Centre, Barnes, SW13 9WT

Martin Mere Wetland Centre, Lancashire, L40 0TA

Slimbridge Wetland Centre, Gloucestershire, GL2 7BT

Washington Wetland Centre, Tyne and Wear, NE38 8LE

Mark Stead, Head of Learning, Wildfowl & Wetlands Trust (WWT)

Mark was a primary school teacher for 11 years and has worked in the environmental education sector for the last 15 years. As Head of Learning at WWT, he oversees a learning programme that is delivered across ten UK wetland centres. Mark has a particular passion for engaging disadvantaged communities, having grown up in one of these communities where he witnessed many of the barriers to people connecting with nature. Mark and WWT believe that nature is for everyone, not just the privileged few.

[1]Mental Health Foundation; *Journal of Environmental Psychology; Natural England; Journal of Happiness Studies*

[2]HM Government (2018) A Green Future: *Our 25 Year Plan to Improve the Environment*. & Natural England (2019) Monitor of Engagement with the Natural Environment – *The national survey on people and the natural environment Headline report 2019*

[3]*wildinthecity.org.uk/?page_id=782*

[4]Anna Cronin-de-Chavez, Shahid Islam, Rosemary R.C. McEachan (2019) *Not a level playing field: A qualitative study exploring structural, community and individual determinants of greenspace use amongst low-income multi-ethnic families, Health & Place, Volume 56, Pages 118-126, ISSN 1353-8292.*

[5]*See the University of Derby Nature Connection Postcard for a concise explanation.*

[6]Current Research in Ecological and Social Psychology; Journal of Environmental Psychology; People and Nature

[7]Otto, S., & Pensini, P. (2017). Nature-based environmental education of children: *Environmental knowledge and connectedness to nature, together, are related to ecological behaviour. Global Environmental Change, 47, 88-94.*

Resources

Picture for Talk

Click to download image

Figure 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 figure 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:

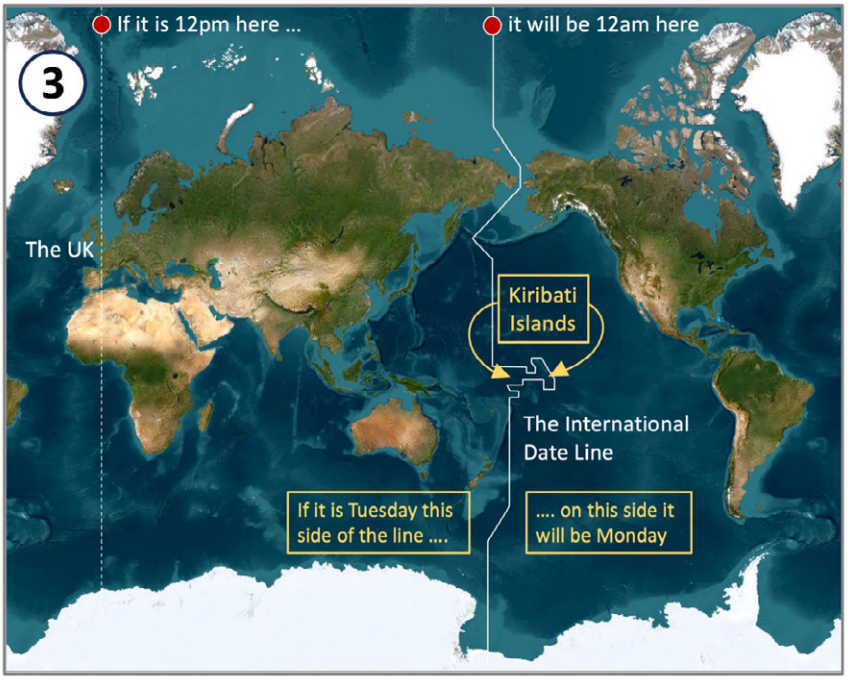
What does this picture remind you of or make you think about?

What do you think it is? Why do you think this? Can you think of other ideas about what it might be?

After the children have shared ideas about what the picture might be, tell the children that it is a close up photograph, taken from the International Space Station, of a remote island called Kiritimati in the middle of the Pacific Ocean. The middle of the island is made up of a series of lagoons which is what the picture shows. Use this **Google Earth link** or another online map to find the island. Gradually zoom out so the children can see the whole island and where it is on the Earth and back in again so they can see a range of close-up features of the island.

About Kiritimati

- Kiritimati is the largest in a collection of 32 atolls (ring shaped islands) that comprise the country called Kiribati (pronounced 'Kiribass'). This group of islands is spread across a huge area of the Pacific Ocean: spanning over 2000Km from north to south (across the equator) and almost 4000Km from west to east;
- Kiritimati was previously called Christmas Island after it was discovered by Cook on Christmas Eve in 1777. Kiribati gained independence from the UK in 1979;
- The international date line originally passed through the middle of the islands; in 1995 the line was moved a long way to the east to bring the all the islands into the same timezone, meaning that the inhabitants of Kiritimati are now the first people on Earth to welcome each new day;
- Kiribati is one of the least developed countries in the world and is dependent on international aid. It has few natural resources and its economy relies on tourism and fishing;
- The islands are highly vulnerable to rising sea levels and Kiribati is expected to be the first country in the world to lose all its land territory to climate change.



Click here to download a slideshow to introduce the concept of the international dateline and use it to prompt further discussion. It is helpful for the children to have access to a globe to support their visualisation of day and night and of concepts such as the equator and the International Date Line.

Further discussion ideas based on images of Kiritimati

For younger primary children

Zooming in and out on an online map of Kiritimati gives opportunities to build children's understanding in different science topics and to link science with geography. Prompt them to scroll around the map and ask them if they find the following:

- An airport
- A beach
- A town
- A forest

Questions to generate and promote thinking and explaining: linking science and geography

- What natural materials can you see?
- What manmade materials can you see?
- What sorts of plants can you see growing? What might make it difficult for plants to grow there?
- What do you think it would be like to live there?
- How do you think people travel round the island? Can you see any cars?

For older primary children

Looking more closely at where Kiribati is on the Earth and being introduced to the concept of the International Date Line can help develop children's understanding of day and night.

Questions to generate and promote thinking and explaining about Earth and Space

- Why do we have day and night?
- When it is day time where we live, where is it night time?
- When does our day change from one day to the next?
- What about countries the other side of the Earth from us, when does their day change?
- Why do you think the world needs to have an International Date Line? When it was created, why do you think people chose to have it going through the Pacific Ocean?
- Why do you think it was a problem for the Kiribati islands when the dateline went through the middle of them?
- What would it be like if the International Date Line went through the middle of the school playground? Or your home? Or the middle of your nearest town?
- What might be the problems with this?
- What might be positive about it?

Resources

Playground Science – finding the science in your school grounds

- How can you maximise the amount of time that children spend engaging with science at school?
- How can you provide children with a richer range of experiences at playtime?
- How can you encourage children to be curious, ask questions and carry out their own scientific enquiries?

One answer is Playground Science, a set of informal and enjoyable science activities children can conduct in their playtimes. The activities use simple instructions and simple science equipment to encourage the children to explore the world around them and to develop scientific skills. Each activity is deliberately semi-structured to allow children to follow the suggestions or make their own decisions about what to do. The activities can be carried out independently or in a group.

- **Find out more about Playground Science and download sample cards here.**
- **Buy a set of Playground Science bags, activity cards and the teacher guide here.**
- **For a quick and easy way to fill the bags, have a look at the ready made equipment kits that TTS-group have assembled specially for Playground Science.**

  Lower Primary kit here.
  Upper Primary kit here.

Playground Science encourages:

- Increased engagement with science
- Curiosity about and appreciation of the environment, both natural and man-made
- Confidence carrying out different types of scientific enquiry and using scientific equipment
- Development of disciplinary and substantive knowledge
- Inclusive playtimes that cater for children with a range of interests
- Children to ask scientific questions and feel empowered to answer them
- The joy of discovery!

The resource is available as a pack for the lower or upper primary age group and comes with a Teacher's Guide which provides information about how to most effectively use the resource to enrich children's science learning. Included in the Teacher's Guide is guidance on the following:

- Staff training to ensure all adults who will be on the playground understand the rationale behind the bags and how to use them.
- Supporting children before they start using the resource to understand how to look after and stay safe using the equipment.
- Suggested systems for organising the bags and filling them with the relevant equipment.

In addition to being used at playtime, the resource could also be used for an after-school science club, as part of a whole-school science day, or for home-learning science activities. Playground Science's flexibility is one of its key strengths.

Explorify

Start with Art: a brand new activity type

Start With Art activities bring science and art together, celebrating the curiosity and creativity that both scientists and artists share. A first set of activities is newly published, with a second set soon to follow.

Each activity slowly reveals a work of art to the children. This might be a painting, drawing, collage, sculpture, model or other sort of artwork. Guided by the questions provided with each activity, children look at the artwork and identify anything they see that links to their learning in science. The links might not always be obvious, and the responses from the children will be varied and interesting! They may also reveal misconceptions, which others in the class can challenge and debate.

All activities start with questions to get children engaged with the artwork:

- Describe what you see.
- How do you think the artist made this artwork? Did they use pencil, paint, collage, clay, or something else?
- What do you or don't you like about this artwork?
- What do you think this artwork is made from?

Follow-on questions are given to prompt children to identify links with their learning in science.

Click on the image to view the activity on Explorify

Cardboard Catastrophe – this activity links to learning about materials

Questions to prompt children to look carefully at Cardboard Catastrophe and to identify links with their learning in science:

- What do people use cardboard for?
- Why would somebody choose it to make an artwork?
- What happens to cardboard when we've finished using it?

Click on the image to view the activity on Explorify

Hidden Lake – this activity links to learning about rocks and also plant growth.

Questions to prompt children to look carefully at Hidden Lake and to identify links with their learning in science:

- What do you think mountains are made from?
- What kind of rocks do you know about?
- Where can you see trees growing?
- Why are they growing there and not higher up the mountains?

Start with Art artworks chosen are by a diverse range of artists and the activity guidance shares information about the artist for teachers who want to explore further with the children.

NB The activities are designed to be used once the children have gained some knowledge about their science topic so by all means start a lesson with art, but not a new topic. Start With Art is more suited to midway through a topic, or even at the end. Click **here** for guidance about using Start with Art with your class.

What Just Happened? More new Explorify activities launched for Early Years

The Early Years expert group has been hard at work and Explorify now offers a collection of over 80 activities especially created for children aged three to five. Last issue we highlighted the newly released Zoom In, Zoom Outs. This set has continued to grow, along with some new Listen What Can You Hear? and What's Going On? activities, and we also bring you a brand new activity type: What Just Happened?

What Just Happened? activities consist of a short video showing a change over time. They feature familiar animals, plants or changing materials. Most children will have seen the changes happening in real life or know about it from stories that have been read to them. But have they really thought about the change? The videos are a stimulus to encourage children to watch carefully and think about what is actually happening and what they already know about what they see changing.

Watching a person made of snow melting encourages focussed observation and discussions that will support later learning about changes of state. Click on the image to view this activity.

You can find all the new activities by selecting Early Years from the drop down menu for Year group on the Explorify home page, and you can then refine the search further by topic or activity type.

For more information and guidance about using the new early years activities, have a look at this three minute helpful read.

Keeping up to date with Primary Science

We know teachers are busy: finding time to keep up to date with the newest ideas, research evidence and reports in primary science is hard. But help is at hand! Take a look at Explorify's helpful read, 'Latest evidence about what works in primary science' for summaries of recent and relevant findings, plus links to useful documents.

I bet you didn't know

Tree restoration – it's now or never

Prof. Dudley E .Shallcross,
Professor of Atmospheric Chemistry,
The University of Bristol

Climate change is a pressing issue for all of us and although there are many ways that we could slow down climate change by using clean energy (Figure 1), one of the best ways is to restore areas that were once populated by trees. Trees absorb carbon dioxide (CO_2), one of the principal greenhouse gases in the atmosphere. These gases are essential to keep the planet's surface temperature habitable. Without any greenhouse gases, the average temperature would be -18°C, i.e. the Earth would be covered in ice and we would have a 'snowball Earth'. However, for the last 170 years, the amount of carbon dioxide in the Earth's atmosphere has increased by 48% above the pre-industrial levels found in 1850, largely due to humans burning fossil fuels (Figure 2). Increasing the amount of greenhouse gases acts like extra layers of blanket and will lead to a warming of the Earth's surface (Figure 3).

Figure 1. Examples of clean energy sources.
(A) wind turbines, (B) solar panels, (C) a hydroelectric dam, (D) a geothermal power plant.

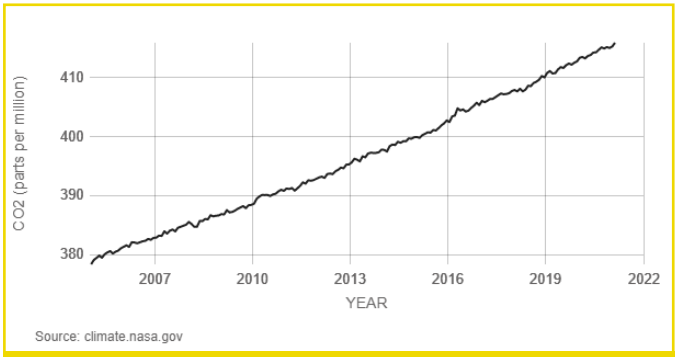


Figure 2. Monthly measurements of carbon dioxide levels (average seasonal cycle removed) measured at Mauna Loa Observatory, Hawaii from 2005 to the present day. Note: pre-industrial levels were approximately 280 parts per million.

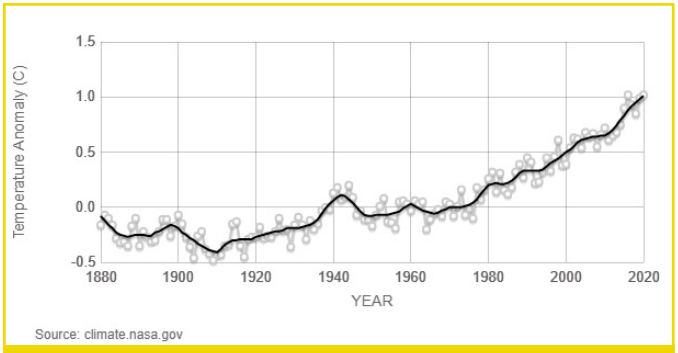


Figure 3. This graph shows the change in global surface temperature relative to 1951-1980 average temperatures. Nineteen of the warmest years (except for 1998) have occurred since 2000.

By increasing the number of trees, climate change can be limited (i.e. we can prevent the warming from becoming too large). In a recent paper by Jean-Francois Bastin and colleagues, they calculated what the 'tree restoration potential' would be under the current climate conditions, i.e. how many more trees we could grow now to slow down climate change, and how many more trees we could grow in 2050 if the climate warms as expected.

These are some questions that we may like to discuss with children in class:

- What do trees need to grow?
- Why can we not plant trees everywhere on the surface of the Earth?
- Why are some areas of the Earth deserts where no growth can occur?
- What information would we need to be able to work out how many trees we could plant in our own local environment?
- Could we plant any type of tree? If not, why not?
- Are some tree types better than others for absorbing carbon dioxide?

Jean-Francois and his team estimate that 4.4 billion hectares of land can support tree growth under existing climate conditions. This is an increase of about 1.6 billion hectares from the 2.8 billion hectares of land that support trees now. However, not all that extra land can be used. Some land is needed to grow food and some to support human development (such as building new houses and roads). The scientists estimate that about 0.9 billion hectares could be used to grow trees in addition to what is already in place (outside croplands and urban areas).

Where in the world are the areas where tree restoration has the greatest potential?

These researchers estimate that over 50% of the new growth needed (0.48 billion hectares) could be established in just six countries (Table 1). The amount of additional carbon dioxide that is emitted into the atmosphere is often referred to simply as carbon. You may have heard the expression 'carbon footprint'. Scientists measure amounts of carbon in huge quantities – gigatons of carbon (GtC). If we restored these forests, it would remove approximately 205 GtC from the atmosphere, a lot of carbon that would go a long way to off-setting climate change (humans have already added about 300 GtC to the atmosphere since 1850). However, if we wait until 2050 before addressing the issue, and using estimates from computer models about the climate at that time, the amount of land area that could be used to grow trees will have reduced from the current levels by 0.22 billion hectares, equivalent to around 46 GtC, and we won't be able to restore these lands to growing trees. Certain regions will become warmer and better for tree growth but most importantly, in tropical regions, where growth is most rapid now, it will become less efficient because the climate will change (notably becoming much hotter and too hot for tree growth).

The scientists who undertook this study have concluded, therefore, that tree restoration is probably the most effective way to offset climate change, but we need to act now and not wait.

Country	Area available for new forest (million hectares)
Russia	151
United States	102
Canada	78.4
Australia	58
Brazil	49.7
China	40.2

Table 1. Area available for reforestation. These countries could provide half of the 900 million hectares needed.

Useful website - see Trees for Cities
www.treesforcities.org *last accessed 02.10.23*

GLOSSARY

clean energy
energy that comes from renewable resources that do not pollute the atmosphere when used, e.g. solar energy, wind energy, hydro energy, tidal energy and geothermal energy

climate change
a long-term change in the average weather patterns on Earth

fossil fuels
fuels containing carbon that have been created by natural processes, such as decomposing plants and animals, over millions of years, e.g. coal, crude oil, natural gas and petrol

greenhouse gases
gases in the Earth's atmosphere that trap heat and contribute to global warming. They let sunlight pass through the atmosphere, but they prevent the heat that the sunlight brings from leaving the atmosphere, e.g. water vapour, carbon dioxide, methane

hectare
a square with sides of 100 m in length, i.e. the area of the square is 10,000 m^2

The paper that inspired this work was:

The global tree restoration potential.
By Jean-Francois Bastin,[1] Yelena Finegold,[2] Claude Garcia,[3,4] Danilo Mollicone,[2] Marcelo Rezende,[2] Devin Routh,[1] Constantin M. Zohner,[1] Thomas W. Crowther.[1]
Published in Science 365: 76-79 (2019) http://doi.org/10.1126/science.aax0848 last accessed 17.03.21
1. *Crowther Lab. Department of Environmental Systems Science, Institution of Integrative Biology, ETH-Zurich, Zurich, Switzerland.*
2. *Food and Agriculture Organisation of the United Nations Rome, Italy.*
3. *Department of Environmental Systems Science, Institution of Integrative Biology, ETH-Zurich, Zurich, Switzerland.*
4. *Centre for Coopération Internationale en la Recherche Agronomique le Dévelopment (CIRAD). UR Forest and Societies, Montpellier, France.*

Don't miss a chance to win a £50 voucher for the Ethical Superstore! Complete our questionnaire by 5th November and enter our **prize draw**.

Initial Teacher Education

The Primary Science Enhancement Award for Initial Teacher Education

The Primary Science Teaching Trust offers its congratulations to all student teachers completing the 2022-23 Primary Science Enhancement Award for Initial Teacher Education. We are delighted that, since the start of the scheme, we have now awarded over 200 certificates.

The award is made to student teachers who demonstrate that they have successfully engaged in **reflective practice and development** in primary science **beyond the statutory content** of their initial teacher education phase. The portfolios submitted by the student teachers are validated by their ITE establishment and by the Primary Science Teaching Trust. The scheme continues to evolve and improve in the light of student and teacher feedback, and for 2023-24 there are over thirty ITE providers offering the scheme to undergraduate and postgraduate students.

What this year's students said after completing the PSEA:

"I thought the tasks were very diverse and allowed participants to be flexible in completing the scheme."

"I feel more empowered to take control of my own professional development in science and to take the lead in planning and teaching effective science lessons. I have a much clearer idea of what I want my class to understand and the range of resources available to support science teaching."

"This has been a brilliant scheme and I have really enjoyed getting stuck into science lessons! I have developed a lot as a practitioner and feel that I am more confident and secure in my ability to teach primary science as a result of completing this scheme."

If you are a tutor in an initial teacher education provider organisation and would like to find out more, please visit the PSTT ITE webpage. To register your interest for your students to take part in 2024/25, please email us.

If you are a student teacher interested in taking part in this scheme please discuss with a science tutor at your ITE institution and encourage them to visit the PSTT ITE webpage to find out more.

Wider Collaborations

The Association for Science Education

The Journal of Emergent Science (JES) is published by the Association for Science Education (ASE) in partnership with the Primary Science Teaching Trust. The journal is open access and bridges the gap between research and practice.

Issue 24, January 2023

Issue 24 begins with two articles that continue the theme of education for sustainability from issue 23. Andy Markwick reconceptualises education for sustainability as being built upon a foundation of environmental consciousness and understanding, and proposes a primary curriculum which is permeated by sustainability. The Recycling + research is an example of a cross-curricular programme exploring the impact of fast fashion, an example of how sustainability education can be taught across the curriculum. The following research articles explore embodied approaches to learning: the Move2Learn project explores the role of gesture, movement, and sensory experiences in supporting primary children's science learning; Into Our Skies: Space in Schools explores how dance can be used to teach about Earth and space.

Issue 25, June 2023

Issue 25 shares research and practitioner perspectives on a variety of approaches to primary science education from early years up to older primary pupils. The issue begins with a research review on how mapping of science practices can help explain and support science learning in early years education and care settings. An original research article follows which explores the impact of the STEM Academy model on primary teacher confidence. In this project, primary teachers are invited to work with secondary school students in a summer school. This is followed by three practitioner perspective articles on different topics: embodied cognition to support environmental education, the use of picture books to enhance science understanding and vocabulary acquisition, and the use of Explorify for retrieval practice to consolidate learning.

Contributing to JES

Contributions to JES are welcome, from practitioners as well as researchers, and full guidance about writing for JES can be found on page 51 of issue 24 and page 50 of issue 25. JES is a biannual online publication covering early years through to the end of the primary phase. Copy deadlines are October for the January issue, and March for the June issue. Authors can submit articles in any of the following categories:

- **Original research:** both small-scale practitioner research and larger projects welcome (maximum of 3000 words, excluding references).
- **Research review:** summary of a larger project or a review of current research in the field (maximum of 2500 words, excluding references).
- **Research guidance:** utilising relevant examples to provide support for practitioner research (maximum of 2500 words, excluding references).
- **Practitioner perspective:** considering application of research from the viewpoint of the practitioner (maximum of 2500 words, excluding references).

Book and resource reviews on science and research for the birth to 11-year age range are also welcome.

Wider Collaborations

What might a future primary science curriculum look like?

This is the question that a group of educators with significant collective expertise and experience in primary science education have sought to answer over the last few years.

The Primary Curriculum Advisory Group (PCAG) was commissioned by the Royal Society of Biology, the Royal Society of Chemistry, the Institute of Physics, and the Association for Science Education. Working in collaboration with a wide range of experts, and drawing on relevant evidence from multiple sources, the group created a framework for the design of a future primary science curriculum. An early draft of the framework was shared at the ASE National Conference in January 2022, and was subsequently revised in the light of delegate responses and further feedback from other esteemed colleagues in the sector.

Framework for a Future Primary Science Curriculum

The purpose of the framework is to support educators to design a curriculum for primary science that is contemporary, cognitively appropriate and relevant for all children, and that lays the foundation for future learning. Its principles are firmly rooted in a vision for primary education that enables children to, 'take their place in the world as informed and responsible citizens, ready and able to meet the global challenges of sustainable and equitable living' (p6). All content included in the framework has been justified by criteria developed from this overarching principle, with equity and inclusion being at the heart to ensure that all children can access and participate in science.

Download a copy of Framework for a Future Primary Science Curriculum here

Primary Curriculum Advisory Group members:

Associate Professor Jane Turner (Chair) – University of Hertfordshire, Director of the Primary Science Quality Mark

Professor Lynne Bianchi – University of Manchester, Director of the Science and Engineering Education Research and Innovation Hub

Ali Eley – Primary Science Teaching Trust, Director of National Programme

Liz Lawrence – Independent Consultant

Dr Alex Sinclair – St. Mary's University, Primary Science Lead

Key dates

2
NOVEMBER 2023
Outdoor Classroom Day

4-6
JANUARY 2024
ASE Annual Conference University of the West of England

12
JANUARY 2024
Closing date for nominating a teacher for a Primary Science Teacher Award

3
MARCH 2024
World Wildlife Day

8-17
MARCH 2024
British Science Week

11
JUNE 2024
Great Science Share for Schools

www.pstt.org.uk

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Primary Science Teaching Trust

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