

Why & How?

Autumn 2017 Issue 1

The Primary Science Teaching Trust Newsletter

Supporting excellent teaching and learning in primary science



Free to
access for
all

Inside this issue:

Common Misconceptions

Dealing with the complexities of teaching and learning about light

How might we calculate the age of a shark?

Free Resources

Research Update

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PSTT recommends that a full risk assessment is carried out before undertaking in the classroom any of the practical investigations and activities contained in this publication.

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Welcome

A very big welcome to our first issue of **Why and How? - the Primary Science Teaching Trust's termly newsletter.**

This year we celebrate twenty years of exciting activity and progress in primary science. Our trust fund was established by AstraZeneca plc in 1997 and since then we have gone from strength to strength. The launch of this newsletter is part of our wider celebration of the progress we have made towards achieving our aim of seeing excellent teaching of primary science in every classroom in every school across the UK.

Why and How? is for anyone who has an interest in primary science. Our newsletter has been designed to offer practical support as well as to update readers with news, research, projects and key dates.

The **news** section will feature notices of future events, updates about PSTT strategy and staffing, and notable achievements within PSTT. This issue includes congratulations to some of our College Fellows for their achievements in winning national awards and sharing their work more widely.

We know how tricky it can sometimes be to deal with children's **common misconceptions**, so in each issue we will focus on a particular area of science and offer expert guidance on how to address these. In this issue you will find a raft of useful suggestions from PSTT College Fellow and Regional Mentor Ruth Shallcross about how to deal with the complexities of teaching and learning about light.

We really want to make it easier for busy teachers, wherever they are, to deliver exciting and stimulating science lessons. Each issue of our newsletter will include some **free resources**. These have been written for any teacher to use, not just science specialists. We

DOWNLOAD ALL ISSUES FOR FREE AT:
www.pstt.org.uk/what-we-do/why-how-newsletter

encourage any teachers reading this to pull out these resources, put copies in the staffroom and encourage all colleagues to try them. Each issue will include a **picture as a stimulus for talk**. Starting with a picture is an open-ended, easily usable and inclusive approach to group talk in science. This picture can be used with any age, and it is hugely flexible; it might start out as a fifteen minute stand-alone activity but could lead to all sorts of other possibilities, e.g. investigations based on what the children identify they want to find out more about.

The Why and How Challenge will be another regular pull-out feature and we hope teachers will enjoy using it with their class or even their whole school. The paper spinner will probably not be a new idea to many, but have you ever thought of using it to create a whole school competition?

In the resources section you can also find out more about the latest developments in our highly successful **Growing Music** project, and we are delighted to offer you a free sample of some of these materials.

“*Why and How? is for anyone who has an interest in primary science.*”

As teachers we know how powerful awe and wonder moments can be for engaging children in science. But finding out and being fascinated by new things is motivating not just for children but for all of us. Each issue of our newsletter will include a feature titled **'I bet you didn't know**' where we will invite contributors to share an exciting piece of real science research and relate this to the principles of primary science teaching and learning. In this issue we are honoured to welcome as the guest author, our very own CEO, Dudley Shallcross. In his article about calculating the age of a shark, Dudley describes some fascinating real world research and offers suggestions about how to bring this alive with children in the classroom.

Our College Fellows are exceptional teachers and are instrumental in helping the PSTT achieve all that it does. We celebrate this in our newsletters by bringing a behind the scenes view of the work and lives of some of our College Fellows.

Our **'In conversation with.....'** feature asks a Fellow to share some of their thoughts about primary science and to explain what drives them. In this issue we meet Robin James who talks about flying cars, Finland and some of his favourite bits of primary science.

Why and How? also brings you **updates** on PSTT research, projects and what is new in primary science. This issue contains a report of the outcomes of our inaugural International Primary Science Conference, held in Belfast in June 2016. Following this fantastic event, a special edition of the Journal of Emergent Science (now produced in partnership by PSTT and ASE) was published and a brief review of this is included here. Also in this section we bring news of how our Academic Collaborators and Strategic Partners work together to identify common themes of research activity and a link to our newly published impact statement.

Lastly, on our **key dates** page, you will find announcements of forthcoming primary science events.

We invite you to share this newsletter with anyone you know who has an interest in primary science, and please do get in touch with us about what you like about our newsletter and what you would like to see in it. Please send your feedback and suggestions to us at newsletter@pstt.org.uk



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Prof. Dudley Shallcross
CEO



Ali Eley
Academic Director



Dr. Sophie Franklin
Cluster Director



Sue Martin
Programme Director





News

BERA Curriculum Journal Prize

PSTT funded project 'Curiouser and Curiouser: Developing an Enquiry-led Curriculum/SPIES', developed at Hudson Road Primary School by College Fellows Debbie Myers and Maria McGrory, was awarded Highly Commended in the BERA Curriculum Journal Prize. This prize acknowledges the importance of collaborative work between schools and universities to support and encourage excellence in curriculum development in schools and colleges.

Debbie Myers has also been commended for her delivery of a STEM workshop to 80 teachers and university science education tutors at the National Science Teachers Association (NSTA) Annual Conference 2017 in Los Angeles.

Debbie said, "The atmosphere at NSTA 2017 was exhilarating and there was such a wave of affection for British science teaching." Her workshop was previously selected for the British Science Festival 2013 in Newcastle and was also awarded CREST STAR accreditation by the British Science Association for its challenging levels of creative problem-solving.

➔ CPRT Pearson Award for Evidence-Informed Teaching

College Fellow Kate Redhead's work on developing teacher interventions that have a significant impact on children's learning has been recognised with the prestigious Cambridge Primary Review Trust Pearson Award for Evidence-informed Teaching. Kate used lesson study and video recordings of children's classroom activities to facilitate reflective discussions with teachers and support them with improving children's talk skills.



➔ Outstanding Achievement Award

One of our academic collaborators, Manchester University has given their 'Making a Difference' Outstanding Achievement Award to Dr Lynne Bianchi for her work on designing and developing **The Great Science Share**. These awards identify projects and schemes that are considered to make a significant change in people's lives and experiences.

➔ Enthuse Celebration Awards

Congratulations to PSTT Fellow Sarah Eames and Sandfield Close Primary School in Leicester. In recognition of their commitment to CPD and its impact on STEM opportunities for the children, the school has recently received the national **2017 ENTHUSE Award for STEM Primary School of the Year** – supported by the Royal Commission for the Exhibition of 1851.



We are delighted to announce that the Trust's CEO, Prof. Dudley Shallcross has been awarded the 2017 Nyholm Prize for Education.

The Nyholm Prize for Education, from the Royal Society of Chemistry, recognises a major national or international research or innovation contribution to the field of chemical science education.

Dudley has made innovations that are effective and long-lasting right across the chemistry (science) education sector in the UK and overseas, from primary school right up to postgraduate chemistry training and education. As CEO of the Primary Science Teaching Trust he has created a College of outstanding primary science teachers. He established the first ever International Conference for primary school science in 2016, bringing together teachers and researchers. As a co-Director of the Bristol ChemLabS Centre for Excellence in Teaching and Learning he has transformed the experiences of chemistry for teacher and learners. To find out more about Dudley's significant achievements in chemistry education please **click here**.

→ Regional Mentors

The PSTT is delighted to announce that **College Fellows Ruth Shallcross and Kate Redhead** have joined the PSTT Team on a full-time basis from September, having been appointed as our first Regional Mentors. Ruth's region will extend throughout London and the South East, whilst Kate will target the Midlands and, at times, as far North as Cumbria. These roles are outward-facing and should enable the impact of the PSTT to extend beyond schools that are currently supported by Fellows and our Area Mentors.

→ Scottish Primary Science Club of the Year

More than 300 pupils from 50 schools from all over Scotland, got stuck into science and engaged in engineering at SCDI's (Scottish Council for Development and Industry) annual Celebration of STEM on the 9th of June.

PSTT **College Fellow Paul Tyler** and pupils from Mearns Primary School's Science Club showcased a range of science experiments including chemical reactions, chromatography, hydrogels and states of matter. The judges were so impressed that they **awarded the top prize of Primary Club of the Year** to the school which received the prize of a special trophy and £500 for STEM resources.

→ Scottish Engineers Leaders Award

Congratulations to PSTT Fellows **Cath Milne** and **Robbie Taylor**, whose students entered the Scottish Engineering Leaders Awards: 2 pupils from Cromarty Primary School and 1 from Linlithgow Primary School were finalists in this competition, a remarkable achievement from over 12,000 entries.

→ PSTT Cluster Programme

Congratulations to the following Fellows and their cluster schools who joined the PSTT Cluster Programme in September 2017:

Robin James

Jeannette Morgan

Anna Hammill

Gail Eagar

Stacey Reid

Each school in the Programme will have access to up to £3,000 across 5 years.

Find out more about the Cluster Programme at www.pstt.org.uk. At this time, applications are open to PSTT College Fellows only.



Common Misconceptions

Seeing the Light



Ruth Shallcross, PSTT
Regional Mentor, tells us
how she helps children
understand the
Principles of Light.

What children need to know:

- *that light travels in straight lines*
- *that objects are seen because they emit light (sources) or reflect light into the eye*
- *that we see things because light travels from light sources to our eyes or from light sources to objects and then (is reflected) to our eyes*

Common misconceptions – often children will think that:

- *sight is purely an active human process 'I am looking at something, which is why I can see it' or that eyes give out a form of light to enable us to see*
- *reflective surfaces emit light*
- *only shiny surfaces or water reflect light*
- *opaque objects do not reflect light*
- *opaque surfaces give out colour or 'darkness'*

When teaching children about principles of light and how we see, I am guilty of holding back the full truth as a stepping stone to clear scientific understanding. Before you judge me, let me explain!

The principle here is seeing learning as a sequential jigsaw, where each new concept that is learnt is tagged on to prior learning. As the sequence progresses, children will need to 'rethink/redefine' some of their earlier understanding.

For children first learning about the principles of light, understanding that both reflective surfaces and opaque surfaces reflect light can be confusing. In an everyday context, children are familiar with reflection being a sense of mirroring connected with the reflections they see of themselves (or other people/objects). This understanding of reflection as mirroring is then further embedded when learning about reflection in maths. So, and here comes the fib, when first teaching children about principles of light, I have found it useful to create a distinction between the verbs I use. For light reflecting off any reflective surface, I use 'reflect'; for light reflecting off any opaque surface, I use the term 'bounce'.

At this stage, I am most concerned with getting on with the business of understanding the abstract concept of how we see, so I wish to avoid confusion.

➔ EXPLORING HOW LIGHT INTERACTS WITH DIFFERENT MATERIALS: TRANSPARENT, TRANSLUCENT, REFLECTIVE, OPAQUE.

Primary school children's initial explorations of materials (typically Years 1 and 2) are from their perceptions of and experiences of materials. A transparent material will be 'a material which I can see through'; an opaque material will be 'a material which I cannot see through'. In Year 6, children need not only to build on their earlier understanding but also redefine it in terms of how the materials interact with light. This is best done through exploration of materials, to see how light interacts with them.

As a result of these explorations, children create new definitions: a transparent material becomes 'a material which lets most/all light through'; an opaque material becomes or 'a material which most light does not pass through' (and translucent materials allow some light to pass through).



Through their own life experiences and the results of their explorations, reflective surfaces and opaque surfaces appear to interact differently with light (Figure 1). I work with this understanding.

Before moving on, children need to *experience* and *understand* that:

- *light sources emit light*
- *light travels in straight lines*
- *without light, we cannot see*



Figure 1: Children explore how different surfaces interact with light.

→ UNDERSTANDING HOW WE SEE OBJECTS

For this learning, I like children to work as a group to create a dynamic model which demonstrates how we see objects. A bouncy ball is used to represent how light travels (Figure 2). Using their model, the children role play and explain the process of how we see objects by breaking it into a sequence.

1. *The light source emits light.*
2. *(Some of) the light travels in a straight line towards the opaque object.*
3. *Once the light reaches the opaque object, some of the light **bounces** off and travels in a straight line towards the human eye.*
4. *Some of the light enters the human eye; as a result, the object can be seen by the human.*

To use reflect instead of bounce here can potentially confuse children because it may conflict with their own exploration/experience of materials.

“But there’s no reflection, so why are you using reflect?”

“But light interacts differently with reflective surfaces and opaque surfaces – we saw that!”

After group work, I will move them on to demonstrating their understanding individually e.g. through the use of a scientific diagram (Figure 3).

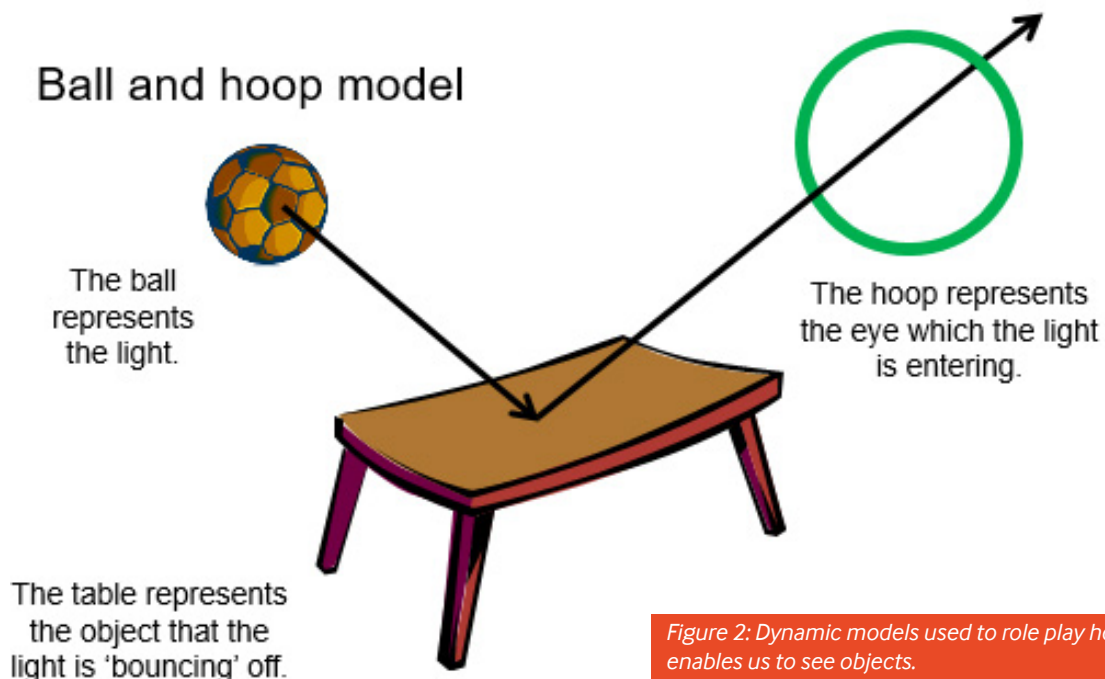


Figure 2: Dynamic models used to role play how light enables us to see objects.



→ UNDERSTANDING HOW WE SEE OBJECTS (OR ORGANISMS) IN MIRRORS

Once children have fully grasped how we see objects, it is time to introduce a mirror! I will ask children to return to their earlier human model and ask – how do we see using a mirror? Children are challenged to add the mirror into the role play.

After establishing the process, they explain.

- *The light source emits light.*
- *(Some of) the light travels in a straight line towards the opaque object.*
- *Once the light reaches the opaque object, some of the light **bounces** off and travels in a straight line towards the mirror.*
- *The light hits the mirror and reflects off travelling in a straight line towards the human eye.*
- *Some of the light enters the human eye; as a result, the object can be seen by the human.*

→ MOVING LEARNING ON

If children understand how we see an object and how we see using mirrors or other reflective surfaces, then they are able to apply their knowledge to a range of different contexts e.g. how we see using a periscope. Once their understanding is totally secure, it is time for the truth!

Both reflective surfaces and opaque surfaces reflect light but why does it appear to be different?

If a surface is flat and very shiny, almost all of the light will be reflected, which produces clear images of objects (my face reflected in a mirror). Light will strike and reflect off at an equal angle.

Opaque surfaces are 'bumpy' in comparison to reflective surfaces. Light does reflect off such surfaces but it scatters in many directions and cannot create clear images.

The difference can be demonstrated using a bouncy ball and a flat tray (to represent the reflective surface) and an upside down muffin tray (to represent the dull surface). There will be a consistency to the direction in which the bouncy ball bounces off the tray but unpredictable scattering when using the muffin tray.

Would you like write a piece for our section on common misconceptions for a future issue of Why and How?

If you have some good ideas for particular areas of science that you would like to share please contact newsletter@pstt.org.uk

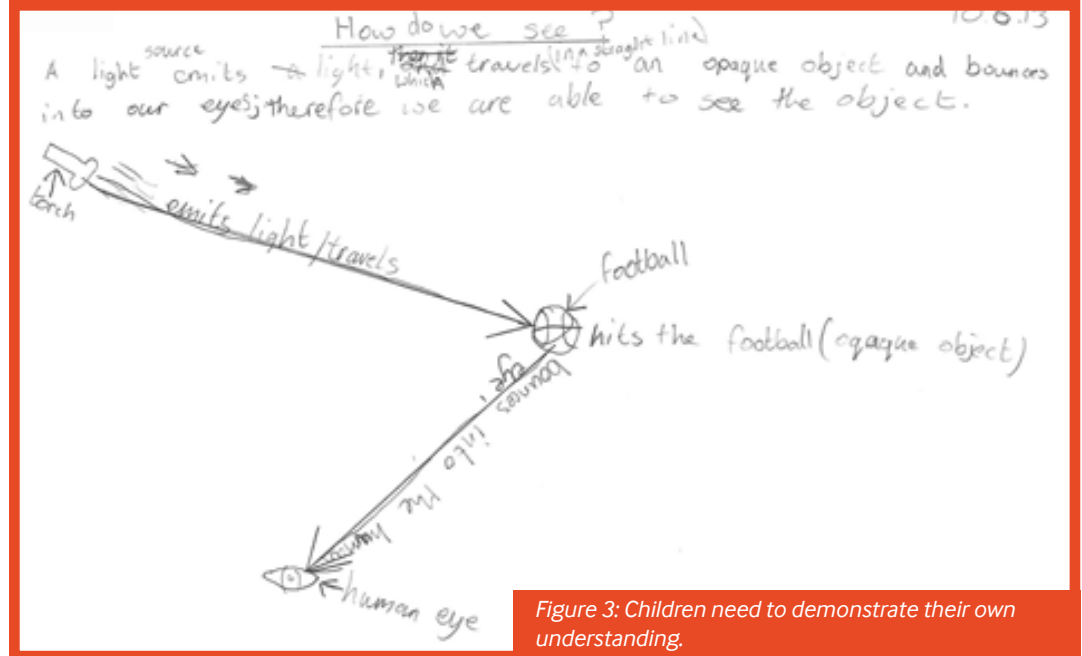


Figure 3: Children need to demonstrate their own understanding.

Ruth Shallcross, has been a PSTT College Fellow since 2013. Previously assistant head and science subject leader at Lavender Primary School in Enfield, Ruth now works full time for PSTT as a Regional Mentor for London and the South East.

This article was developed from work produced by Ruth Shallcross in collaboration with Jason Harding and the London Borough of Enfield's School Improvement Service.

 ruth.shallcross@pstt.org.uk





Free resources

Pictures for talk in primary science



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 inquiry. 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 any age of children. 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 overleaf by following the link to the Literacy Shed, and either display on a whiteboard or give children printed copies. Ask the children to discuss, in groups of three, the following question:

How do you think that the tree got inside the house? Why do you think this?

Other questions to generate and promote thinking and explaining

- What can you see that is living?*
- What can you see that is not living?*
- What is the house made from?*
- What do you think happened to its roof?*
- How might the house have looked different before?*
- What might it look like in the future?*
- How long do you think the tree has been inside the house?*
- What does the tree need to stay alive?*

Follow-on activity to extend thinking and explaining:

Ask the children to draw what they think this scene would have looked like 100 years ago.

Ask them to draw what they think it will look like in 100 years time.



[CLICK TO DOWNLOAD IMAGE FROM WWW.LITERACYSHED.COM](http://WWW.LITERACYSHED.COM)



Free resources

The Why and How Challenge

The 'Why and How' Challenge is intended to be something for the staffroom table that lots of teachers will try.

This issue's Why and How Challenge is based on a **PAPER SPINNER** – something that may already be very familiar, but have you used it as a **WHOLE SCHOOL COMPETITION** before? Set every class the question 'can you make the slowest spinner?'

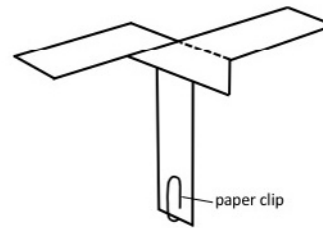
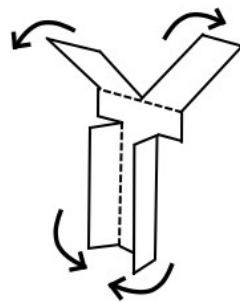
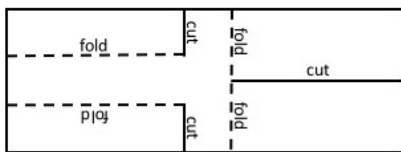
Paper spinner: starter template and instructions

FOLD along the dotted lines

CUT along the solid lines

FOLD the two 'wings' in opposite directions

PAPER CLIP the three folded pieces of the tail of the spinner



RESOURCES

Spinner template - download [HERE](#)

Different types of paper or card

Paper clips

Scissors

WHAT TO DO

Give each child a copy of the spinner template and draw their attention to the lines – dotted lines are for folding and solid lines for cutting. They should cut and fold the spinner and put a paper clip at the bottom to hold the three parts of the tail together. Tell them to hold the top of the spinner between their fingers and just let it fall to the ground. They might need a bit of time to practise this.

The children can then be encouraged to think about and explore all the factors that might affect how fast the spinner falls, e.g. length of wings, width of wings, length of tail, width of tail, number of paper clips, type of paper the spinner is made from, height of drop.

HINT – it is easier if children work in pairs/groups and compare two or more spinners when dropped at the same time, rather than time one with a stopwatch

After the children have had time to explore, give them the question: "Can you make the slowest spinner?"

Tell the children about the whole school competition and that, as a class, they are going to produce **one spinner**, that **falls as slowly as possible**. This will then be their class entry to the competition.

RULES FOR THE WHOLE SCHOOL COMPETITION:

- the spinner itself has to be made only from one layer of paper/card
- the weights have to be paper clips
- the basic design should be based on the one provided (i.e. will open out as a rectangle), but adaptations to this are allowed
- no glue or tape can be used
- no restrictions on the number of paper clips you can use
- no restrictions on size or proportions of the spinner

RUNNING THE COMPETITION:

This is best done as a knock out. Two classes at a time race their spinners against each other in a best of three. The winner (slowest) goes through to the next round and so on.



Free resources

From PSTT's own collection

The Primary Science Teaching Trust has a range of printed materials available to purchase, all of which have been **developed by our award-winning teachers** through Trust funding.

This section of our newsletter will highlight free resources on our website, and also offer some samples of resources on sale.

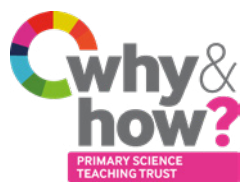
Click here to download your **FREE** copy of **Growing Music!**



Growing Music is a WOMAD Foundation project which brings together music, science and design technology within a cultural context. It was developed by Annie Menter and Mauricio Velasierra supported by Anne Goldsworthy. The detailed lesson plans were devised entirely by PSTT College Fellow Carol Sampey with Kulvinder Johal.

The project is based on growing bamboo and making and playing Colombian 'sikus' or pan pipes. It features science, music and DT with other cross-curricular links. There are also details about how to bring a Colombian musician or other artists from across the world into your school. It is suitable for children in Key Stage 2.

Includes:
How to make panpies,
Growing Bamboo,
Science Planning &
Learning Objectives,
Teacher Tips,
Cross-Curricular links,
& Background Science Knowledge





I bet you didn't know...

How to calculate the age of a shark



Prof. Dudley Shallcross, PSTT CEO, links cutting edge research with the principles of primary science

“392 YEAR OLD GREENLAND SHARK DISCOVERED!”

But how did scientists know the age?

If sharks had birthday parties you could count the number of candles on their cakes (assuming you were invited to their parties) but in reality, how can we work out their age?

This is something that we can ask our primary school children, and it would be interesting to hear their answers.

Teeth may be a good indicator: their size, number or length may be a measure of age, or perhaps they can be dated in some other way?

Would height be a good measure of children's age in your class or the whole school? If we lined everyone up according to height, would it be the same as their relative ages? Could we make a calibration curve? Would the curve work for adults or older children?

It turns out that sharks renew their teeth and even if the teeth can be dated, they will only provide a minimum age for the shark (we may want to ask the children why this is a minimum age). This may be an important factor in age determination and it is possible to extract a shark's tooth without killing the shark.

Maybe sharks have rings (like trees) and these can be used to determine age? Vertebrae (back bones) contain concentric pairs of opaque and translucent



CAN YOU CALCULATE THE AGE OF A SHARK BY LOOKING AT ITS TEETH?

bands and these band pairs can be counted to provide an estimate of the age. For example, if there are ten band pairs we may assume that the shark is ten years old. However, these rings can only be measured if the shark is dead and this is not ideal.

We may want to discuss how valid this assumption is with the children. It turns out that very careful studies of each species of shark are needed to determine their growth rate (they are all different) and that growth rate may change with time for each shark (later growth may be much slower).



We could just measure the length of the shark to provide an estimate of its age. Sharks continue to grow (as far as we know) for the whole of their lives. Measuring the length is a non-destructive way of gathering data. However, we still need some data that is reliable to calibrate the length against age (we may want to ask why).

In the 1950s and 1960s there were many nuclear bomb tests and this released a lot of ^{14}C (carbon-14) into the atmosphere. ^{14}C is the heavier sibling of the much more common ^{12}C (99% of carbon weighs in at 12 atomic mass units) and once released in the atmosphere, it forms $^{14}\text{CO}_2$ which is taken up by the oceans and vegetation and will become incorporated into food webs. We know very accurately the amount of ^{14}C that was in the atmosphere in any given year from the start of the bomb tests. So, any shark alive from the 1950s onwards will show evidence of this increase in ^{14}C . However, if there is a part of the body that it is not altered biologically from birth and retains the ^{14}C at birth, then we can work out precisely (to within a year) when the shark was born. One part of the body, the inner eye lens, is sealed off from the rest of the eye (this is true for humans too) and remains unchanged, unlike the rest of the lens. Analysis of the ^{14}C level in this inner eye lens gives a good estimate of the age of sharks born during

or after the nuclear tests. So what? Well, Greenland sharks are caught inadvertently and those that cannot be saved have been killed humanely, their lenses analysed and a whole range of other parameters measured, including length. It turns out that a rather good calibration curve can be generated (length versus age) for the sharks born post-1950 and using this curve, estimates of the pre-1950 sharks can be made using their length. Although the uncertainty increases the further away from the data that was used to construct the curve, the longest shark caught was estimated to be 392 years old. Now, the length of a shark can be used to estimate its age and this can be done without killing a shark. This also means that sharks live for a very long time, much longer than previously thought. The oldest sharks may have been swimming under the ships that took the first pilgrims to the USA.

Why might sharks live so long? It would be very interesting to hear the children's views on this. An obvious reason would be that they are the top predator and apart from being caught inadvertently by humans, they have nothing that would kill them. Another may be that they have a plentiful supply of food. What other suggestions might children give?



CAN YOU CALCULATE THE AGE OF A SHARK BY MEASURING ITS LENGTH?



In conversation with...

Dr. Sophie Franklin, PSTT Cluster Director, talks with College Fellow **Robin James** about Finland, flying cars and some of his favourite bits of primary science.



- *Exeter Road Primary School, Exmouth*
- *Science Subject Leader*
- *21st year of teaching at primary level*
- *Primary Science Teacher Award 2013*
- *He has taught year 3 for the last seven years, and now teaches science across the school. From September, Robin will be teaching Foundation as well.*

Let's start with discussing some of the interesting science projects you've been involved in.

At the moment I'm running a project called 'Looking for Learning', which is focussing on peer assessment and girls' attitudes to STEM, which ties in with my Masters' studies.

My projects have been twice shortlisted for the Rolls-Royce Science Prize; in 2011 and 2014. One, based in my school, involved designing, building and testing mini-greenhouses, and in the second, involving four schools, we created sand yachts to race on the beach.

Tell me some interesting facts about yourself that other College Fellows may not know...

Previous to teaching, I trained to be a wine merchant for a while – the more I think about it, the more I realise it had to do with science! I also taught in Finland between 1994-95 and also in 1998.

What are your drivers?

Curiosity - I don't know all the answers, I don't even know all the questions. I've still got the same excitement at making discoveries and connections as the children – part of me will always be 7 years old trying to make sense of the world.

Very few of the teachers that I trained with are still teaching, which is sad really. But then I think about the many helpers who volunteer just for the tonic of the children's company, energy and enthusiasm." I like what Bill Bryson said: "The thing I say to teachers most often is 'don't forget the magic of it, or forget what drove you to do it.'"

It's a fast-changing world. There's the internet, GPS, stem cell research, robotics, space exploration... What will come next? A driver for me is to communicate to children how it's through science that we shape our understanding of the world, and how it's science that may ultimately save us and the world.

When you were at school/growing up, how would you describe your attitudes to science?

Sadly I can't recall a single science lesson at primary school. I have an uncle who's a physicist. He drove a Saab 96, and when I was a child he convinced me that it could fly! He'd drive us to the beach along a straight stretch of road, explaining that the wings



had malfunctioned. We believed him! The Open University science foundation course I took in my early twenties re-ignited my interest in science. In secondary school, an inspiring Geology teacher called John Macadam once took me and two friends on an informal trip to the Camborne School of Mines, stopping en-route at an arsenic mine, a nuclear protest camp and a real ale and cheese shop. That was an education but it wouldn't happen now! He was an inspirational guy.

What are your favourite lessons/topics to teach in science?

I would say anything outdoors such as exploring rock pools and the Jurassic coast. I've just contributed a seaweed classifying piece to the Let's Go! Science Trails.

I've recently read the most fantastic book, 'Stuff Matters' by Mark Miodownik, about materials, which is just fabulous and now I can't wait to teach materials; he's reinvigorated my interest in materials.

Evolution and Inheritance is another one, which is fairly new. I'm taking Year 6 to Charmouth in a couple of weeks to hunt for fossils with Anjana Ford.

I'm quite well known as somebody who loves any opportunity to bring a bit of technology into the science.

Where do you find your ideas?

Walking, running, talking with my wife, she's a therapist - all teachers should have one, that's probably why I'm still here!

Teaching is a Magpie profession. Pinterest is one of the first places I look when I'm adapting other people's ideas – it has some really good practical primary science ideas.

Who are your influences?

David Attenborough is surely everybody's dream dinner party guest. My year 6 children were transfixed by clips from his 1973 Royal Institution Christmas Lecture. Caroline Herschel was a trailblazer for women scientists. Michio Kaku, who writes about the physics of the future. Douglas Adams for his sense of humour and perspective on the achievements of humankind. And Oliver Sacks, a neurologist who wrote some brilliant books. I do read quite a lot!

What are the most common issues that your colleagues ask for support with?

My colleagues seem happy to let me get on with it as I teach all the science across the school. But questions that did come from them during other

projects were mostly physics-based questions, but I was lucky to work with a great STEM ambassador, Rodney Battey, who could always assist in clarifying things.

“Pinterest is one of the first places I look when I'm adapting other people's ideas – it has some really good practical primary science ideas.”

What is not in the science curriculum you would like to see?

This is a difficult one, as I'd rather see a curriculum that is entirely non-statutory – a curriculum with aims showing possible pathways to take like the one I experienced in Finland. Teachers were involved in research as a matter of course, without a punitive inspection system. There's more respect for the profession there.

What are your future plans for science in your school?

I'm really excited because we've just received Cluster funding. The six schools I'll be working with are in a fantastic part of the world, with a beach, the Exe estuary and Jurassic Coast nearby. Perhaps we'll develop another project that makes the most of that.

What difference has it made being a Fellow and being part of PSTT?

It's fantastic, it's allowed me to become more expert at something I love. I've nearly completed a Master's, thanks to PSTT, which I started at the National Science Learning Centre.

I spent a 'dream day' at the Natural History Museum, where I was able to handle botanical specimens hundreds of years old behind the scenes at the Hans Sloane Collection.

I have met some amazing and inspirational people among the Fellows.



Follow Robin on Twitter @SandYachtGuy



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Research Update

Journal of Emergent Science

The JES is now published by the ASE in partnership with the Primary Science Teaching Trust. This partnership has enabled the journal to become open access. In addition, the age range covered has been extended to cover early years through to the end of the primary phase. Following the Primary Science Teaching Trust's inaugural International Primary Science Conference, held in Belfast in June 2016, a special edition of the Journal of Emergent Science was published.

The eleven articles presented in this special issue (12) take the form of either an empirical research paper, or a theoretical paper offering suggestions for practice grounded in established theory, or a scholarly report of a practical or discussion session held with teachers. They all encourage active teacher reflection and support professional development.

The issue features papers which focus on a range of topics including creative approaches in the classroom, science leadership and professional

development, assessment, and primary-secondary transition. Many of the contributing authors are collaborators and funded PhD students of the PSTT.

Deb McGregor's paper describes her innovative work gives children a new motivation to work scientifically as through drama they experience being in role as scientists. Her findings suggest that this use of drama can achieve greater independence in science inquiry.

Assessment in primary science continues to present a challenge to schools. Sarah Earle discusses the issues with making assessment processes valid, reliable and manageable, and how the TAPS (Teacher Assessment in Primary Science) project can support teachers with this.

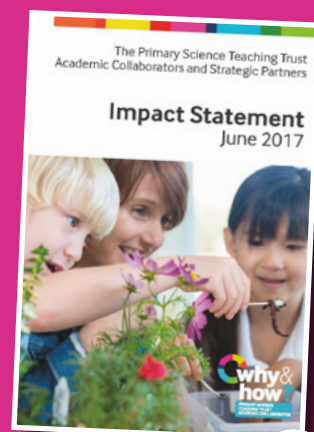
Two papers consider approaches to the professional development of teachers. Through rich descriptive reflections from teachers, Lynne Bianchi describes and explores a five stage developmental model for effective CPD. John McCullagh and Andrea Doherty address concerns about the time spent on primary science in Initial Teacher Education programmes. They describe their 'Student Teachers' College' project and how this engages teachers in their own professional development journey right from the start of the career.

Sally Howard and Liz Coppard both explore aspects of primary-secondary transition, focussing on the pedagogy of scientific enquiry and the teaching of the nature of matter.

PSTT Collaborators

The Primary Science Teaching Trust's Academic Collaborators and Strategic Partners work together to identify common themes of research activity to keep the Trust at the forefront of the development and implementation of effective strategies for teaching, learning and leadership of primary science.

Click to read our impact statement which demonstrates how we are addressing some of the most pressing current issues in primary science across the UK.



The Journal of Emergent Science can be downloaded for free at www.ase.org.uk/journals/journal-of-emergent-science





Project Update

International Conference 2016

From the 9th to the 11th of June, 2016, the Primary Science Teaching Trust hosted its inaugural International Conference in Belfast.

The three-day event took place in Belfast's Waterfront Hall and was attended by over 350 delegates from across the UK, including a number of international teachers. Over 60 workshops, seminars and presentations were led by world-class teachers, academics, educationalists and four outstanding keynote speakers; Professor Alice Roberts, Dr. Stuart Brown, Professor Danielle George and Dr. Maggie Aderin-Pocock. Themes included:

- *Outdoor Learning*
- *Assessment*
- *STEM*
- *Early Years*
- *Space*
- *Creativity for all*

Our connecting research in practice sessions brought together academics, educationalists and primary practitioners, to promote rich discussion of the theory underpinning classroom practice and professional development supported by research. These sessions provided enjoyable and thought provoking opportunities for delegates to interact with some recent research in primary science education. Delegates were encouraged to think beyond identifying good practice and adopting new strategies, and to engage with WHY these practices and strategies are effective, and HOW they can best be implemented into their own practice.

The Conference not only attracted a lot of attention within the region, (SYNCNI, Belfast Live, the Belfast

Times and BBC Radio Ulster), but also from outer space with a special tweet from Tim Peake!

Even if you couldn't attend the Conference this time, you can still access the inspiring and engaging sessions on offer by downloading the presentations and files from our website for free. We recommend you also scroll through the Twitter feed from the Conference for even more ideas shared by our delegates using #PSTTBelfast. To find out more about the extensive workshops, seminars and research in practice sessions, **download the Conference Brochure.**

[Click to view and download session information, worksheets and presentations](#)

The conference was designed to break down barriers and boundaries that stand in the way of excellent primary science teaching and from the feedback received so far, we believe we have helped and inspired a number of teachers to reflect on their own practice and keep up their fantastic work in science.



"I've never been to a conference where the sessions were so relevant and of such high quality."

International Conference Delegate, Belfast, 2016



Key Dates

PSTT International Conference



6th - 8th
June
2019



Edinburgh
International
Conference Centre
(EICC)

Save the date and join us in Edinburgh for our Primary Science International Conference!

We are determined that there should be no barriers to every child receiving an outstanding education in primary science, and we are committed to our vision that teachers are the key to making this happen. Through crossing boundaries between the classroom and academia, between policy and practice, and between one nation and another, our conference in 2019 will empower educators to develop excellence in primary science.

Manchester University Great Science Share



19th
June
2018



University of
Manchester
#GSShare18

GSS aims to put children at the heart of sharing their love of learning. #GSShare18 will inspire, engage and celebrate science with a range of audiences in creative ways.

ASE Annual Conference



3rd - 6th
January
2018



University of
Liverpool

The conference programme offers over 350 sessions, covering all phases and all levels from NQTs to Heads of Department. Visit the exhibition only and get free entry with around 100 exhibitors offering resources, ideas and equipment. There is a dedicated primary day on Friday the 5th of January.

Primary Science Teacher Award Deadline



13th
July
2018



Nominations will
open via the website
in January 2018

Do you know an outstanding primary science teacher?

These awards celebrate amazing primary science teaching across the UK, recognising talented teachers in early years, Key Stage 1 and Key Stage 2. Teachers who win this award are not only judged to be outstanding practitioners in their own classrooms, they also support and develop colleagues in their own schools and others either locally, regionally or nationally. Award-winning teachers are also innovative, creative, enthusiastic and will have significantly raised the profile of science in their own schools and beyond.

PRIMARY SCIENCE TEACHER AWARD WINNERS 2016

Lucy Blackmore	Ryders Green Primary School, West Bromwich
Julia Burger	Heygreen Primary School, Liverpool
Jane Catto	Briar Hill Infant School, Leamington Spa
Liane Clegg	St Anne's RC Primary School, Manchester
Kathryn Horan	Greenhill Primary School, Leeds
Christine Lawson	Laurel Avenue Community Primary School, Durham
Emma Muntoni	Our Lady of the Assumption RC Primary School, Coventry
Sarah Parkinson	Adel Primary School, Leeds
Kelly Thomas	Penllergaer Primary School, Swansea
Amy Woolgar	Manor Primary School, Uckfield



Achieving a Primary Science Quality Mark will raise the profile of science in your school

Celebrations for PSQM awards stretch across the UK and as far as Singapore!



PSST's Chair of Trustees, Mike Rance, presented awards to Far East schools at an event in Singapore.



PSQM Director, Jane Turner, visited Holy Cross Primary School in Glasgow to present a well-deserved PSQM award



Members of the Lancashire PSQM hub receiving their schools' awards at the Museum of Science and Industry in Manchester

“ It really brought science to the forefront of our curriculum and empowered teachers to be more confident and excited about teaching science. ”

PSQM Round 10 Participant

What is PSQM?

The only national award for science in primary schools

- A supported whole school initiative which will make a positive difference to the quality and profile of science in your school
- Exceptional subject leader professional development

What's involved?

Schools achieve a PSQM award through the process of initial audit, followed by action and reflection, all supported by expert face to face training and mentoring. PSQM evaluates and develops science in the following areas:

- Subject Leadership
- Pupils & Learning
- Teachers & Teaching
- Broader Opportunities

If you would like to register to take part in PSQM Round 15 beginning Autumn 2017 please go to www.psqm.org.uk to register your interest.

SAVE THE DATE!

6-8 June, 2019

Edinburgh International
Conference Centre (EICC)

Primary Science Teaching Trust International Conference

Are you:

- A teacher with a passion for primary science?
- A school leader who wants to improve the quality of teaching and learning of science in your school?
- An academic who wants to engage with primary science research and connect with practising teachers?
- An organisation with a commitment to primary science?

Then this conference is for you!

From 9th to 11th of June 2016, the Trust hosted its inaugural International Primary Science Conference in Belfast.

Over 60 workshops, seminars and presentations were led by world-class teachers, academics, educationalists and outstanding keynote speakers including; Professor Alice Roberts, Dr. Stuart Brown, Professor Danielle George and Dr. Maggie Aderin-Pocock.

We are determined that there should be **no barriers** to every child receiving an outstanding education in primary science, and we are committed to our vision that teachers are the key to making this happen.

"I've never been to a conference where the sessions were so relevant and of such high quality."

Delegate, Belfast, 2016

"Great event. Possibly the best UK based type educational thing I can remember in a while."

Delegate, Belfast, 2016



Through **crossing boundaries** between the classroom and academia, between policy and practice, and between one nation and another, our conference in 2019 will continue to break down the barriers and empower educators to develop excellence in primary science.

Our conferences exemplify the best in primary science from around the world and include:

- Inspirational speakers.
- Practical ideas to take back to the classroom.
- World-class CPD opportunities.
- Networking and practice sharing.

Register your interest today at
primaryscienceconference.org