

# CONNECT

THE JOURNAL OF PRIMARY  
SCIENCE DEVELOPMENT IN  
STOKE-ON-TRENT

**ISSUE 8:** TRIED, TESTED AND CELEBRATED  
IN STOKE-ON-TRENT

SEPTEMBER 2022







## Professional Development Libraries

Building on a legacy success of a strong culture of professional community, SATC has set up two professional development libraries for those seeking to improve primary science. These resources have the potential for sustaining and growing more reflective talk, more critical thinking, and so more young people with improving life chances in the City.

### For more details contact

Lucy Holdcroft SATC CPD Library North

The Phizlab @ Moorpark Junior School

[info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)

Emily Royall SATC CPD Library South

The Phizlab @ St Maria Goretti Primary school

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This issue of **CONNECT**, along with previous issues, can be downloaded from The Science Across the City website <https://www.scienceacrossthecity.co.uk/>  
They can be located by clicking on the Impact tab.

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# Context and Background

## Building Legacy



**Tried, Tested and Celebrated in Stoke-on-Trent**

**Summer Conference 2022**

The Stoke-on-Trent Science Influencer conference, summer

2022, was framed to create conversations around the legacy

and sustainability of the OA funding.

### Legacy & Sustainability

To enable consistent reflections, the SATC leads defined legacy as being what is left behind because of something happening, whilst sustainability is how to continue to make good things happen. Attendees unanimously agreed there is a strong legacy of knowledge in Stoke-on-Trent. Our science leaders, teachers and education community know more and can do more than they could at the start of the project. As such the conference lunch was renamed and celebrated as a 'legacy lunch' deepening community cohesion with tried and tested swap stories. Attendees were determined to increase access and reach of the collective knowledge that has been tried, tested and celebrated in Stoke-on-Trent. A proposal for Science Influencer voices to be collated in an easy to reference guide useful to all those new to role as well as those wanting to refresh or to identify next steps. As such issue 8 of CONNECT moved from a concept to reality and is available as a gift from Stoke to all primary science subject leaders.

Friendships and relationship are a great strength of the whole project.

If we have learnt anything from the whole Science Across the City adventure it is the importance of building networks.

### A new look at action planning

Anne Goldsworthy's sticky note approach to developing clear questions is well used in many classrooms to support children to identify variables and explore causation. The same sticky note approach was piloted as a tool for focused action planning, helping leaders to think about what difference they were trying to make by doing what they planned to do.

What changes/interventions might a SL choose?

**Independent Variable**  
- What you might change?

Increase variety of approaches

Increase real life links

More focused recording

Improved sequencing

What are we observing as a result of the change/intervention?

**Dependent Variable**  
- What you might observe or measure?

Close the gap

Everyone included

Pupils remember more

Teacher enjoyment and confidence

### Don't re-invent the wheel

This journal captures Science Influencer conversations, signposting, tips and tricks for effective and efficient subject development actions. Don't reinvent the wheel - listen to the voices of those who have tried, tested and celebrated impact on primary science teaching and learning in the city.

### Science Influencer Voices

To conclude, if legacy is about the hearts and minds of our teaching community, then one of the keys to sustainability is hearing the teacher community voice.

To discuss building capacity and systems leadership contact Tina Whittaker or Karen Peters. Read more at <https://www.gov.uk/government/publications/opportunity-areas-insight-guides>

# Reflections from the Editor

“Always leave them wanting more!”

P.T Barnum



It is with huge pleasure we present to you a circus of so much that is superb in the world of primary science. Read on and I am convinced we will leave you wanting more! I am thrilled to be sharing yet another legacy resource from Science Across the City. The Contents page alone provides an ‘at a glance’ summary of the resources that our Science Influencers have identified as having the greatest impact on science teaching and learning in their own schools. The subsequent pages fill in some of the details and signpost the reader to sources of further information. This makes it an invaluable resource both within and beyond the City. The perfect gift for every science subject leader!

The theme of this journal is ‘Tried, Tested and Celebrated’, and it is the teacher Science Influencers of Stoke-on-Trent whose voices can be heard loud and clear through these pages. They have been bold, taken risks, tried something new in their classrooms, and reflected on their successes. Through reflective practice they have even developed resources like CALM, BM:BS and SEFSS to help science leaders and teachers everywhere.



We know that resources throughout these pages have been tried, tested, developed where necessary, and approved by teachers across Stoke-on-Trent. Therefore, we are confident they provide useful tools for teachers and science leaders far and wide.

Watch out for the latest development, SENSE, an example of which is featured on page XX. This is still in the early stages of development and, if you would like to get involved in trialling and improving this potentially valuable resource, find out how by reading the article.

This issue provides a great overview of the primary science landscape. With my PSQM Hub Leader hat on, I can’t wait to share it with PSQM participants as an excellent summary of some of the options available to them to develop science teaching and learning in their schools. The tried and tested stamp reassures me that it works in the classroom and is therefore useful to real teachers.

The reason Science Influencers are so keen to try, test and celebrate resources to support science teaching

and learning is to benefit the children of Stoke-on-Trent. I have been flicking through past copies of CONNECT. I would encourage everyone to do the same and become reacquainted with forgotten gems. It was so easy to find evidence of the impact on children and I would like to share a few of the quotes I rediscovered:

- The pupils are so excited by science, keen to use their developing scientific vocabulary and ask questions about the world around them. They have become scientists! Emma Edwards
- I have certainly seen an increase in pupils’ confidence – they are more willing to have a go. I also feel that the pupils are more inquisitive. Karen Carney
- The ideas the children come up with about ways to improve science are just fantastic! Michelle Condliffe
- The Science Influencers work together in the interests of what’s best for the children. Julie Clarke
- We took 60 children to the Eden Project. It was fantastic. The experience of a lifetime for the children that attended. Ash Jones

Although this is the final Opportunity Area (DfE) funded issue of CONNECT, we bear in mind the PT Barnum quote from above. We know that innovation in the world of primary science education continues, and new resources are continually being developed. We know from the conference that the Science Influencers are keen to continue to develop and evaluate new approaches and strategies in practice. We know that science leaders across the country, and beyond, want more:

- More information about the rigour the development team have applied
- More support to make the right choices
- More opportunities to learn about the benefits and drawbacks of each resource
- And not simply more stuff!

SATC continues its drive and passion to link schools with appropriate offers and to support those seeking to help to tailor available resources to the needs of learners.

Clare Warren

**Note:** Many STEM providers have several offers that might have featured in more than one of our four themes. However, SATC Issue 8 protocols necessitate that each organisation or resource appears only once. Such a huge array of STEM offers exist that any listing can never be complete. The SATC guide is written by teachers for teachers to plot their own route through the complex and ever-expanding STEM landscape.



# What should I be doing? How can I develop science yet further?

## Leading an effective curriculum for science

“ Subject leaders provide professional leadership and management for a subject to secure high quality teaching, effective use of resources and improved standard of learning and achievement for all pupils. ”

DfE Teachers' Standards Framework 2001

### Ponder:

- Where can I find structured support to develop science leadership?
- Where might I find like-minded thinkers immersed in developing primary Science education?
- Where can I meet other SLs regularly to stay up to date?
- How can I monitor for meaningful development and positive change?
- How do I support and encourage the professional learning of others?

### ■ Where can I find structured support to develop science leadership?

#### → Science Across the City recommends: Primary Science Quality Mark



The PSQM mission is to transform lives by improving science education in every primary school, for every teacher, for every child.

The Primary Science Quality Mark (PSQM) was launched nationally in 2011 and since that time over 4500 schools have achieved a PSQM. It has become known nationally (and in some cases internationally) as an effective vehicle for whole school improvement. More than just a certificate, PSQM offers a year-long school improvement programme for primary science developing confident, knowledgeable reflective subject leaders.

The process starts with an audit of existing science provision against thirteen wide-ranging criteria. An action plan is then created and implemented to develop all aspects of science leadership, teaching and learning. Finally, a reflective submission is created using key pieces of evidence to demonstrate the impact of the actions.

Since the inception of SATC, PSQM has been one of the corner stone offerings and much appreciated by those science subject leaders who have embarked on the journey.

We really focus on the learning and making it relevant to children's life experiences

Julie Clarke

Through PSQM we became well-informed by a number of primary science stakeholders and our work was rooted in a deeper evidence base.

Ash Jones

I was quite isolated as science subject leader, but thanks to PSQM I began to make those links.

Michele Condliffe

To find out more [www.psqm.org.uk](http://www.psqm.org.uk).

Local school based PSQM hub leaders Becki Price and Andie Hughes will be happy to welcome you to their next hub or to answer any questions you might have about PSQM. Contact through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



■ Where might I find like-minded thinkers immersed in developing primary science education?

→ Science Across the City recommends:  
The Association for Science Education



The Association for Science Education (ASE) is very much a members' organisation, active in the UK science education landscape and beyond. It is a professional community dedicated to supporting excellence

in the teaching and learning of science. Individually, or institutional memberships are available. See [www.ase.org.uk](http://www.ase.org.uk).

**The offer includes:**

**Participation:** The **ASE Annual Conference** is, for many, the highlight of the primary science calendar and a great opportunity to hear about the latest thinking in science education. With a wide range of workshops and presentations about all phases of science education. It is the ideal opportunity to meet with like-minded individuals and immerse oneself in the world of science education.

**Accreditation:** The ASE is empowered under its Royal Charter to administer Professional Registration awards as a licensed body of the Science Council. One of these awards, **Chartered Science Teacher (CSci Teach)** is the ultimate accolade for the primary (or secondary) science teacher and recognises excellence in science teaching and learning.

**Engagement:** The ASE's Journal, PS (Primary Science), is published five times each year and contains a fascinating range of articles of interest to any primary science teacher. It is a great place to learn about the latest resources designed to support primary science, new lesson ideas, thoughts about best practice in pedagogy and curriculum, and so much more. Recently the teacher reflective thinking behind Jasper the Spider was featured in issue 173 <https://www.ase.org.uk/system/files/PS%20173%20p16-18%20Hughes.pdf>

**Guidance:** The **ASE Primary Science Leaders' Survival Guide** can be downloaded for free by members and offers helpful advice on a wide range of issues that science subject leaders will face. From developing a vision for primary science to making effective use of assessment, this is a superb source of knowledge and advice for both new and developing science leaders.

**Updates: ASE Webinars** are available on a broad range of topics of interest to science teachers in all phases. Free to members these are recorded so the back catalogue is available, for example, the Response to the Ofsted Research Review was particularly popular. Published guidance on how the review relates to primary science practice and support further professional dialogue See <https://tinyurl.com/OfstedReviewGuidance>.

**Reflection: #ASEchat** a weekly on-line science education discussion group conducted via Twitter that takes place on Monday evenings from 8 to 9pm. Everyone welcome to tweet along!

**Activities:** Look out for **ASE competitions**, usually simple and easy to get involved. One example that is popular is the Great Bug Hunt. Check the ASE website in spring 2023

We won an award though the bug hunt competition. The transition teacher from the local junior school was at their award event celebrating across two schools. Parents were so enthusiastic that our school was a winning school

Being a coach I need to know I am talking sense. The ASE gives me credibility and I feel secure in the knowledge of what I share.

I was very proud when my article was published

Professional stretch – ASE has something for everyone from Teachmeet sharing to book review evaluations.

Yippee we are in print.

I felt so proud after I presented my workshop

I was so nervous when I presented my first teachmeet

Locally to discuss ASE conference, accreditation, competitions etc contact Dawn McCann, Nikki Beech, Becki Price and Andie Hughes. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



■ **Where can I meet other subject leaders regularly to stay up to date and reflect upon practice?**

→ **Science Across the City recommends:**  
**The Ogden Trust. From two Ogden partnerships at the start of the project to four by September 2022. Ogden is active and pro-active in the City.**



The Ogden Trust supports schools, teachers and projects aiming to enhance physics education and uptake of physics post-16. The Trust is particularly keen to provide support

in disadvantaged areas. One way in which they do this is through funding School Partnerships to enable a group of schools to work together with the support of an Ogden Regional Representative to develop local clusters of schools committed to enhancing physics teaching and learning. Through these partnerships Ogden provides financial support over 5 years to enable them to organise activities. In addition, CPD, supported by free resources, is provided to teachers in each primary school, and partnerships may also apply for funding for a PhizLab which can be used to enhance physics teaching and learning in all partnership schools.

The local Ogden Trust Regional Representative is Scott Walker who is based at Keele University and is happy to discuss how to apply for funding to build a new partnership where one does not exist.

Ogden network develops collaboration and the phizzi CPD sessions are amazing.

SPOTY was a brilliant evening. I grinned from ear to ear! And I am still buzzing.

SPOTY nominations brought different schools together. A fabulous way to celebrate with our children. It was lovely to have children, parents, teachers and senior leaders all enjoying shared success across different schools.

The Ogden trust also offers a wide range of resources on the website.

- Working scientifically – videos and fact sheets to explain the different types of science enquiry identified in the National Curriculum

- ‘Ideas over time’ series considers how ideas in science and technology are not static but develop over time. Creating these as card games is an approach that is simple and effective and makes a great link to history too.

Phizzi CPD provides staff with confidence as well as resources and helps us to facilitate brilliant investigations for children. Phizzi CPD is top of my list of good stuff



Schools in Partnerships also benefit from Phizzi Practicals: Curriculum linked practical activities and access to a Phizlab.

To find out more, visit <https://www.ogdentrust.com/resources/>

Two local established Ogden Trust Phizlabs are hosted by Emily Royall at St Maria Goretti and Lucy Holdcroft at Moorpark. They will be delighted to welcome you to their science learning spaces and support you to become familiar with Ogden resources, and a range of scientific equipment. Contact through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



■ **How can I monitor for meaningful development and positive change?**

→ **Science Across the City recommends:**  
**SEFSS Self Evaluation Framework Science Specific,**  
<https://www.scienceacrossthecity.co.uk/sefss/>

SEFSS is a legacy resource freely available. SEFSS was developed in Stoke-on-Trent as a framework for those new to the role of reviewer. The framework is made up of question prompts to stimulate evidence gathering from different sources. SEFSS has been used in over twenty different schools. Subject leaders, following the review, asked to have a copy of the prompts and tell the Science Influencers that the SEFSS tool has been adapted for other subjects. One school now uses something similar to structure curriculum governor reports.



I actually enjoyed my recent Ofsted Deep Dive. I was so prepared that I felt proud to talk about the developments we have made in science.

Reviewing 'The Stoke Way!' has increased my confidence and I have now led on subject reviews in other schools in my MAT

Locally to discuss the SEFSS framework or to shadow a deep dive process talk to Ash Jones, Becki Price, Dawn McCann.



→ Science Across the City recommends:

The 10 Key Issues with Children's Learning in Primary Science in England', <https://seerih-innovations.org/just-good-stuff/10-key-issues>

1 CHILDREN'S SCIENCE LEARNING IS SUPERFICIAL AND LACKS DEPTH

2 CHILDREN'S PRECONCEPTIONS AREN'T ADEQUATELY VALUED

3 CHILDREN'S SCIENCE LEARNING LACKS CHALLENGE

4 CHILDREN ARE OVERRELIANT ON TEACHER TALK AND DIRECTION, THEY LACK AUTONOMY AND INDEPENDENCE IN LEARNING SCIENCE

5 CHILDREN EXPERIENCE 'FUN' SCIENCE ACTIVITIES THAT FAIL TO DEEPEN OR DEVELOP NEW LEARNING

6 CHILDREN ARE NOT ENCOURAGED TO USE THEIR OWN CURIOSITY. SCIENTIFIC INTERESTS AND QUESTIONS IN THEIR SCIENCE LEARNING

7 CHILDREN ARE ENGAGED IN PRESCRIPTIVE PRACTICAL WORK THAT LACKS PURPOSE

8 CHILDREN DO NOT DRAW ON THEIR LEARNING FROM PRIOR SCIENTIFIC SKILLS. THEY DO NOT BUILD ON REPEATED AND REGULAR EXPERIENCES

9 CHILDREN RARELY SEE THEMSELVES, THEIR FAMILIES, COMMUNITY MEMBERS OR THEIR TEACHERS AS SCIENTISTS

10 CHILDREN DO NOT APPLY LITERACY AND NUMERACY SKILLS IN SCIENCE AT THE STANDARD THEY USE IN ENGLISH AND MATHEMATICS

The 10 Key issues report, or as sometimes referred to 'the purple document', is a collation of findings from deep dives completed in three different regions in England. Similarities were mapped, collated and the final list put out to full sector consultation across consultants, advisers, headteachers and inspectors. The perspectives gathered from being the external eyes and ears for children and representing their voices were then compiled and published in 2020. Many users of the report find that initially they are shocked by the hard-hitting language that captures the problem children experience loud and clear. This is a deliberate approach to persuade those that can take action to be moved to do so quickly.

The purple document is focussing SMT and SLs on learning rather than to do lists.

I like feeling like we are not alone if we are struggling with an issue - Less personal critique and more motivationalists.

I use it to set priorities for subject leadership development.

I felt confident when I had the purple document on the desk when I was interviewed by Ofsted - I could refer to national research at a glance.

The best staff meeting I have ever run. Light bulbs for teachers.

To find out more speak to one of the two local subject leaders taking part in the phase 2 development with the University of Manchester, Ash Jones and Emily Royall. Many of the local Science Coaches are now quality assured to complete science school reviews through 'The Stoke Approach!'. These include: Karen Carney, Dawn McCann, Ash Jones, Becki Price, and Grace Marsdon. Contact through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



■ How do I support and encourage the professional learning of others?

→ Science Across the City recommends:

That all teachers should access professional learning opportunities that are relevant to their interest and needs. The case for subject specific CPD being more effective than generic CPD is well-established. Our top choices for subject specific CPD are shown over the page.

National CPD available to all – Tried tested and celebrated in Stoke-on-Trent



STEM Learning offers a wide range of STEM CPD including residential courses at the National Centre in York as well as a range of courses

delivered locally through a network of STEM learning partners. Remote and on-line CPD also form part of their offering. Bursaries may be available to support state-funded schools. Full details of the courses can be found at <https://www.stem.org.uk/primary>.



Free on-line primary science modules offered through a collaboration between Imperial

College London and tigtag. A range of 30 courses are available covering the topics in the primary science curriculum, providing teachers with the subject knowledge they need to teach those topics and resources to use in class. A certificate is available to download on completion of each module. Register for free at <https://www.reachoutcpd.com/>

The course I did at York was and still is one of the best courses I've ever been on and I'd 100% recommend it as worth the travel and overnight stay.

My school received money back as a bursary for attending the course at York - I didn't realise we would get this. Happy days - more money to do great stuff in science.

Local SLP facilitators accredited to provide CPD: Ash Jones, Rachel Griffiths, Andie Hughes, Becki Price, Jane Antrobus, Emily Royall, Scott Walker. Contact Stephen Burrowes at [SBurrowes@potteries.ac.uk](mailto:SBurrowes@potteries.ac.uk)



Every new teacher should know about reach out.

Don't just send the link for CPD to staff- They already get too many e mails! Arrange buddies to have a go at a unit and schedule time for professional talk. Teacher talk for learning.

Remember it is only CPD if you do something different in your practice afterwards. A certificate is not the same as meaningful CPD!

Our teachers like Reachout as they can study without anyone knowing that they didn't know. Primary teachers can't know everything but are expected to be experts in everything.

Primary teachers can't know everything but are expected to be experts in everything

Knowing where to look for expertise has saved me so much time.

New ideas from CPD keep the profile of science high.



## Pupil Conversation (Curriculum)

Suggested approach: A guided work look. Encourage children to bring their books/ floor books/ ipads/ etc and ask them to 'show you' as you ask the questions. It helps to focus the conversations and avoid answers that children give simply to please their teacher.

Prompt	Notes
Turn to a page in your book and show me a piece of work that you are particularly proud of. Why did you choose this page? What did you learn?	
What have you learnt about before this in Science? (Have a copy of the NC handy to check previous year group teaching.)	
Do you think that you are good at science? How do you know? Where in your book did you do good science?	
Do you ask your own questions in science? Who decides how you will find answers to your questions/enquiries? Find a question your teacher asked. Find a question you asked.	
Why is learning about Science important? Do you know any scientists? Is there a link to a scientist in your work? Show me a piece of work that you might talk to someone at home about? Why that topic?	
What do you do if you don't understand something?	
What do you find hardest in Science? What helps?	
Do you learn about or do or read about or watch programmes about science outside of lessons? Clubs or home	



# What do the children need to know? How will we know when they know it?

## Sequencing the curriculum

“ A high-quality science curriculum not only identifies the important concepts and procedures for pupils to learn, it also plans for how pupils will build knowledge of these over time. Careful curriculum design, where new knowledge is broken down into meaningful components and introduced sequentially, can support all pupils to learn scientific concepts.”

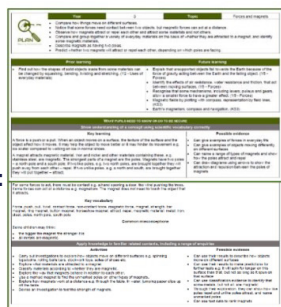
(Ofsted Research Review Series: Science, 2021)<sup>1</sup>

**Ponder:**

- How do I ensure pupils’ science subject knowledge is appropriately sequenced?
- How do I ensure progression in the discipline of working scientifically?
- How do I develop effective primary science assessment?

■ How do I ensure pupils’ science subject knowledge is appropriately sequenced?

→ Science Across the City recommends:  
Pan London Assessment Network (PLAN)



**PLAN Knowledge Matrices include:**

- the relevant prior and future learning (showing how the curriculum is progressive)
- the current learning and vocabulary that the children need to have acquired
- examples of possible activities that enable pupils to learn or apply the knowledge
- examples of possible evidence that would indicate that children are secure in the learning and vocabulary.

The PLAN resources also include examples of pupils’ work for each topic and each year group to support understanding of what progression might look like over time.

As well as helping staff to make sound judgements throughout the year related to each topic, PLAN has helped massively with planning. Useful tip for curriculum planning is to start with the outcome and expectations and then work backwards to the activity.

Start with the misconceptions

To find out more, visit <https://www.planassessment.com/shop>  
Locally to discuss PLAN contact Adam Lowell. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



→ Science Across the City recommends:  
**PSTT (Primary Science Teaching Trust)**



PSTT provides a wealth of resources to support teaching, learning, assessment and subject leadership in primary science. Signing up to their regular newsletter is free and keeps subject leaders informed about new and great stuff that is being released. Three of the PSTT

The vocabulary in PLAN is actually age group appropriate. Too many lists of hard science words are out there but PLAN can be trusted

tools noted by Science Influencers, with much flag waving, at the conference are given but there are many more depending on a school's need.

Planning Tool: To support curriculum coverage and staff with effective medium term planning PSTT fellows share this link: [https://pstt.org.uk/application/files/9016/0208/7433/Primary\\_Science\\_Curriculum\\_Progression\\_2020.pdf](https://pstt.org.uk/application/files/9016/0208/7433/Primary_Science_Curriculum_Progression_2020.pdf)

Love the easy at a glance single side- I use it to check I have everything in my plan



**EYFS Guidance Tool:** PLAY - OBSERVE - ASK: For EYFS find out more at <https://pstt.org.uk/resources/curriculum-materials/eyfs-science>

To support EYFS with ideas, resources, approaches and the philosophy of practice that builds and recognises the skills of thinking and behaving like scientists. Subject leaders that are not in EYFS found this site helps them to know what is good practice and helps them to help others. The Early Years team invited one of the authors of the resource entitled PLAY-OBSERVE-ASK to provide training. The feedback from EYFS practitioners was simply brilliant. <https://pstt.org.uk/resources/curriculum-materials/eyfs-science>

All in one place and so easy to use

At the meeting they said I could adapt the resource – I don't want to adapt it. I like it just the way it is. Thank you so much!

Science Capital Tool: **A Scientist just like me!** <https://pstt.org.uk/resources/curriculum-materials/ASJLM>. To support teachers with ideas and links to broaden the horizons of children who may have limited role models or awareness that science plays an important role in their lives now and in the future. Some local schools link this resource to careers curriculum plans and a few schools have run Dress as scientist days and made reference to the resource

Locally to discuss PSTT contact our PSTT fellows in Stoke-on-Trent, Dawn McCann, Julie Clarke, Karen Peters, Janine Carpenter, Vicky Peake. To discuss the PSTT curriculum tool contact local advocates Michelle Condliffe and Robert Pattinson. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



→ **Science Across the City recommends:**  
**The CALM resource, a tool originating in Stoke during COVID.**

Although many people know about CALM, few people know the origin of the acronym and so to reveal the play on letters. The first school closures due to COVID 2019 sent a

wave of panic and frenzy across the sector. SATC were keen to reduce teacher workload and create a way of focussing on threads of learning that, if missed one year, could be traced through to the next opportunity. This included transfer points between KS1 to KS2 and KS2 to KS3. These tools remain useful beyond the COVID closures as they support the current culture of teaching gaps and driving a catch up curriculum whether that catch up is due to a school being closed, a child missing school or just that the concept wasn't understood the first time. The key message in 2020 when CALM was launched was 'STAY CALM' and keep on learning. The acronym revealed..... Compare Adapt Listen Make Meaningful, in fact, it started as CALM! The full set by year group, including year 7, can be found at <https://www.scienceacrossthecity.co.uk/useful-tools/>

Locally to discuss CALM contact teachers who contributed during the design stage of the resource. Nikki Beech, Dawn McCann, Lucy Holdcroft and Becki Price. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



■ **How do I ensure progression in the discipline of working scientifically?**

→ **Science Across the City recommends:**  
**TAPS (Teacher Assessment in Primary Science)**

TAPS, TAPS and more TAPS! Over the three years of SATC Sarah Earle, the author of TAPS, supported our teachers to get going with TAPS, to focus on TAPS, and to evaluate and contribute further to TAPS. TAPS is not one thing. The more TAPS you do, the more you get from it! TAPS is a generic term and increasingly the specific tools or themes need to be linked to the reason that they are being used. TAPS is often linked only with and directly to assessment, but whilst important to assessment and the systems for assessment it is so much more.

Science Influencers at the conference talked about two resources that have had a huge impact on progression for working scientifically. The 'wheel' and 'focussed assessment tasks'.

**The TAPS Enquiry Wheel**

All teachers need to be familiar with what it means to be working scientifically. The enquiry cycle shows how the skills fit together and the focussed tasks help to show how each skill progresses or how the children become more proficient in the skill. Every classroom in Stoke-on-Trent was given a large poster of the wheel and these were to be dated when the skill was used. Subject leaders simply wandered in and out of classrooms to see if gaps were starting to appear and class teachers could select their next objective by cross referencing their own wheel at a quick glance. <https://taps.pstt.org.uk/responsive-teaching/teacher-layer-downloads/>

<https://pstt.org.uk/what-we-do/assessment>



**TAPS Focused Assessment Tasks**

Once the enquiry cycle is experienced regularly, then it is time to look at each skill and building explicitly upon the prior learning. This can be achieved through planned focussed assessments and supporting children with their next steps to make progress at working scientifically. The TAPS tools provide a range of examples of pupils' work but it is not each task that is important, but the process and principle of knowing what you are looking for in order that you can assess it. Many Science Influencers have developed their own tasks using the approach modelled with the national resource.

**Overview of TAPS plans for Focused Assessment of Working Scientifically**  
Only focus can be chosen for open-ended enquiries, these are only suggestions

Plan	Topic	Year	Open-ended enquiries	Planned enquiries	Planned enquiries	Planned enquiries	Planned enquiries	Planned enquiries
AS1	Force and motion	KS1	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion
AS2	Force and motion	KS2	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion
AS3	Force and motion	KS3	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion
AS4	Force and motion	KS4	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion
AS5	Force and motion	KS5	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion
AS6	Force and motion	KS6	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion
AS7	Force and motion	KS7	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion
AS8	Force and motion	KS8	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion
AS9	Force and motion	KS9	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion
AS10	Force and motion	KS10	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion	Force and motion

**How do I develop primary science assessment?**

Science Across the City recommends: **The TAPS Pyramid**  
<https://psstf.org.uk/what-we-do/assessment>

Science influencers at the conference recognised the sense and logic of the TAPS pyramid but their comments highlight that for those coming new to TAPS, there has to be a good understanding of the function of assessment before the pyramid becomes truly useful. To simply say I know about the pyramid actually doesn't help at all- In the words of wise subject leaders:

The more you know about different aspects of good assessment, the more you can dip in and use the pyramid to audit and identify a new next step to do things even better.

Don't start with the pyramid but one you start with assessment then keep using the pyramid. It is so full of information; it is not one thing but many layers.



Locally to discuss all things TAPS associated contact Becki Price, Dawn McCann, Luci Baker and Ash Jones. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



➔ Science Across the City recommends: **Best Evidence Science Teaching (BEST)**

**BEST**™ Best Evidence Science Teaching (BEST) is a collection of free resources for secondary school science, although some are very useful to primary teachers. Science Influencers developed a set of year 5 and year 6 standard questions for all schools to use then have discussions about the questions causing most difficulty both within school and for teachers between schools. More of this appears in CONNECT Issue 4 Innovation from Stoke-on-Trent. Nationally BEST resources have been developed from research evidence on common misunderstandings in science, effective diagnostic questioning, and formative assessment, constructivist approaches to building understanding, and effective sequencing of key concepts.

Coming soon from the BEST team!  
 Exciting announcement - the National BEST Primary resources will be launching specific support for the teaching and learning of Earth and Space available at the end of August 2022. [www.BestEvidenceScienceTeaching.org](http://www.BestEvidenceScienceTeaching.org). Watch out for associated webinar CPD too.

The question analysis has given me a chance to look at gender breakdown. I am thinking about inclusion very differently.

It has really made me think about why the topic of gravity might be challenging.

We liked the year 6 diagnostic process so much we now use a set at the end of year 5 to inform year 6.

We use a BEST question whenever we can.

I wish we could find the primary relevant questions easier. More BEST for primary please!

Locally to discuss BEST and how it was used for year 6 and year 7 transition contact Becki Price, Dawn McCann and Ash Jones. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)





# Making SENSE of science enquiry

## Scaffolding enquiry to develop scientists in primary schools

### The Acronym

#### Science Enquiry from Novice Scaffolded to Expert

#### From Novice to Expert

A novice learns a new skill by watching or listening to an expert in that skill. Children in school are novices learning to get better at the skills of working scientifically. Many teachers in primary schools also consider themselves a novice at working scientifically. SENSE therefore considers both audiences and provides scaffolds for planning for the classroom and for direct instruction in the classroom.

### The Scaffolds

#### ■ Expecting and anticipating learning gaps. Creating an S-plan for Enquiry

The making SENSE approach adopts and adapts tools that have already been found to be useful in many schools for maths. The maths mastery approach splits the curriculum into three spines with each spine further split into segments<sup>1</sup>. Maths teaching teams collectively order the segments for a curriculum for their setting and their children that is progressive. The outcome is commonly referred to as the maths S-plan. Examples for maths can be found via social media platforms.

SENSE seeks to address the gap between core subjects as similar S-plans for science do not currently exist. Therefore:

- SENSE provides eight science enquiry spines. Each spine defines the expertise that is age appropriate by key stage for working scientifically skill. Downloadable templates to print A3 at [www.scienceacrossthecity.co.uk](http://www.scienceacrossthecity.co.uk) (launch due October 2022)
- SENSE provides subject leadership guidance to introduce and build enquiry S-plans. Downloadable staff meeting as power-point slides at [www.scienceacrossthecity.co.uk](http://www.scienceacrossthecity.co.uk) (Launch due October 2022)
- SENSE shares completed S-plan exemplars created by Science Influencers sharing practice. Available to view at [www.scienceacrossthecity.co.uk](http://www.scienceacrossthecity.co.uk) (Asking questions, conclusion writing, making predictions and evaluation writing currently available)

#### ■ Direct teaching approach. Introducing the I Do, We do, You do approach to teaching scientific enquiry.

The making SENSE approach adopts and adapts the three stages of explicit instruction currently making a difference to maths and English learning in many classrooms. Explicit instruction starts with clear modelling, the “I do” stage, then guided practice, the “We do” stage and once students are performing the skill independently the “You do” stage.

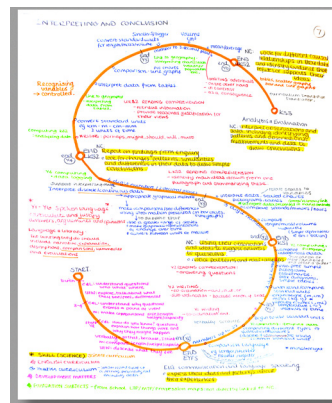
To read more about explicit instruction as a gradual release method of teaching visit <https://www.evidencebasedteaching.org.au/the-i-do-we-do-you-do-model-explained/>

SENSE seeks to address the gap between core subjects as lesson plans through the explicit instruction approach to working scientifically skills are rare. Therefore:

- SENSE commends the scaffold of I do, We do, You do when teaching children the skills of working scientifically.
- SENSE exemplifies the thinking aloud steps for the ‘I do stage’, when an expert is demonstrating a skill like a scientist. Find conclusion writing and disciplinary reading at [www.scienceacrossthecity.co.uk](http://www.scienceacrossthecity.co.uk)
- SENSE revisits and refreshes effective tools for the guided practice of skills. Download the subject leader audit checklist at [www.scienceacrossthecity.co.uk](http://www.scienceacrossthecity.co.uk)
- SENSE challenges the common approach to the ‘You do’ stage in practice. Traditional ‘I can’ child-friendly statements are extended from ‘I can’ to ‘I can because I know...’. The connection between the ‘I do, we do, you do’ and ‘I can because I know...’ scaffolds now becomes apparent as what you need to teach if the children don’t know is in the S-Plan.

### Making SENSE of science Enquiry

Progression, progression, progression is the current mantra in school strategy. Knowing more, remembering more and being able to do more is the nationwide mission. For children to know more about enquiry, remember more about enquiry, and be able to get better at enquiry skills, SENSE sets out to scaffold working scientifically to model what it means to work like a scientist (even when one does not yet identify as a scientist!).



An S Plan taking shape. (Aug. 2022)

“From I can...”

“To I can because I know”

Templates will be available at <https://www.scienceacrossthecity.co.uk> (Useful tools)

Or contact [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk) to be connected to the writers and join the pilot phase of trialling.

<sup>1</sup> <https://www.nceim.org.uk/teaching-for-mastery/mastery-materials/primary-mastery-professional-development/number-addition-and-subtraction/>

# What is the best way to teach children the science they need to know?

## Sequencing the curriculum

“A bad curriculum well taught is invariably a better experience for students than a good curriculum badly taught: pedagogy trumps curriculum. Or more precisely, pedagogy is curriculum, because what matters is how things are taught, rather than what is taught.”

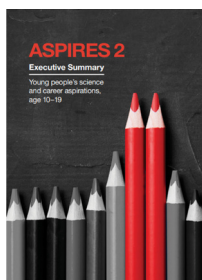
Dylan William

### Ponder:

- How can I improve inclusivity in all classrooms for all children?
- Which resources best support effective science teaching and learning?
- How do I ensure practical work is carried out effectively and safely?

### ■ How can I improve inclusivity in all classrooms for all children?

→ **Science Across the City recommends:** SATC recommends that all subject leaders refer regularly to the Aspires report.<sup>1</sup>



The ASPIRES research identified that girls and other under-represented groups may not see science as ‘for me’. The authors of an article entitled, ‘Not girly, not sexy, not glamorous’<sup>1</sup> claim that, “constructions of science careers as ‘clever/brainy’, ‘not nurturing’ and ‘geeky’ sits in opposition to girls’ self-identifications as ‘normal’, ‘girly’, ‘caring’ and ‘active’.” These views were also shared by the girls’ parents and found

to be particularly true for working class girls. While girls state that gender is not a barrier to studying any course or career, what happens is that gender-traditional study and job roles are selected in practice. The ‘not girly’ research<sup>2</sup> concluded that strategies should be implemented to, “increase science capital within UK families, to help make science more ‘known’ and familiar within families’ everyday lives.”

Work to increase science capital is already taking place across Stoke-on-Trent and thanks to involvement in developing the Primary Science Capital Teaching Approach (PSCTA), the HDMT STEM Sisters production, the Curiosity Clubs and the influence of the PSQM criterion encouraging the development of science capital, pupils across Stoke are already feeling the benefit. To find out more read issue 7 of

<sup>1</sup> <https://discovery.ucl.ac.uk/id/eprint/10092041/>

<sup>2</sup> ‘Not girly, not sexy, not glamorous’: primary school girls’ and parents’ constructions of science aspirations (2013) Archer, L., DeWitt, J., Osborne, J., Dillon J., Willis, B., & Wong, B.

CONNECT. The SATC team would like to share three great sources of information to enable teachers and leaders to find out more and influence their understanding in this important area.

Sometimes we go so far down one path we forget the reason we are doing it

Inclusion is not discussed enough. Equity of opportunity affects life chances. Inclusion isn’t just about SEND it is so much more.

→ **Science Across the City recommends:** Primary Science Capital Teaching Approach<sup>3</sup>, and Science for Everyone.



The Primary Science Capital Teaching Approach was co-developed by researchers and teachers (including Emily Royall from Stoke-on-Trent), with the aim of making primary science teaching more engaging and more equitable.

The PSCTA Handbook can be obtained as a download or hard copy. Scott Walker Regional Representative from the Ogden Trust will shortly be accredited as a PSCTA trainer and hopes to be facilitating PSCTA across the City starting from Autumn 2022 onwards. To register your interest email Scott on [scott.walker@ogdentrust.com](mailto:scott.walker@ogdentrust.com).

<sup>3</sup> <https://www.ucl.ac.uk/ioe/departments-and-centres/departments/education-practice-and-society/stem-participation-social-justice-research/primary-science-capital-project>

PSCTA enriches learning and increases motivation by making it relevant to children's lives.

Emily Royall

I have completely rethought how I lead into a topic.

→ Science Across the City recommends:  
The Wellcome Connecting Science's Public Engagement programme.



Francesca Gale is the Education and Learning Manager for the Wellcome Connecting Science's Public Engagement programme. Fran recently collaborated with Stoke Science Influencer, Becki Price,

in piloting the first 'Adopt a scientist' cohort in May 2020. Adopt a scientist is designed to build sustained relationships between children and scientists with the aim of challenging misconceptions around STEM roles, gender and diversity.

Prior to 'adopt a scientist' Fran provided CPD around the issue of unconscious bias. She reminded participants of a favoured quote she uses: **'There are no bad people, just bad thinking habits. Unconscious bias is a thinking habit we have learned and which we can unlearn.'** Professor Patricia Devine, University of Wisconsin-Madison. This enabled teachers to not be afraid of feeling guilty or embarrassed but instead to be collectively determined to change. Whilst accepting that it is OK to make mistakes there needs to be a deliberate attempt to make fewer mistakes. The resources developed for the CPD are freely available.

Science for Everyone offers training and a practical tool kit for teachers and school leaders to address issues around unconscious bias and stereotypes. To quote their website "Unconscious Biases develop and are maintained from our culture, our experiences and from the media we absorb. In the case of gender stereotypes if we are repeatedly exposed to experiences where females are seen as the caregivers and home makers, that can unconsciously be reinforced. Likewise in science, if all media coverage and our experiences are of white males in lab coats this can reinforce a gender stereotype around science careers." The training toolkit and classroom resources aim to tackle the negative effects of unconscious bias and ensure teachers follow a more equitable approach to teaching the whole curriculum. Find out more at <https://www.science4everyone.org>

Locally to discuss the concept of science capital and increasingly inclusive science education contact Scott Walker, Emily Royal, Luci Baker, Ben Leighton, and Rhiann Curran. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



■ How can I improve inclusivity in all classrooms for all children?

"Everyone will take a different journey as a teacher of primary science, but whichever route you take, listen to the children's ideas, for they will help you decide where to go next."

Sarah Earle

→ Science Across the City recommends:  
Explorify, Thinking, Doing, Talking Science (TDS) and A Creative Approach to Teaching Science by Nicky Waller



Explorify is a free online resource of engaging, creative science activities designed to inspire questioning, deepen thinking

and extend reasoning skills. Challenges develop scientific enquiry skills and group tasks build confidence. Activities include zoom-in-zoom out pictures, odd one out, videos and hands-on activities. Originally created by the Wellcome Trust.

I use Explorify for home-school connected learning. The 'What if' questions make brilliant collective whole school displays.

Talk for learning  
Talk for challenge  
Children love to talk about the science.

Be ready for the unexpected ideas.  
Constructing meaning depends on the teacher responding at the right time.

Locally, to discuss EXPLORIFY and the benefits of using it in classrooms, contact any of the Stoke Science Influencers. This resource is celebrated by every Science Leader in the city. Those new to science leadership are encouraged to find out what the overwhelming positivity is all about. Contact details to link with an Explorify Champion through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)





→ **Science Across the City recommends:**  
**TDTS (Thinking Doing Talking Science)**



Thinking Doing Talking Science (TDTS) is an interactive four-day training programme for teachers focusing on developing creative and challenging science lessons that encourage pupils to use higher-order thinking skills. Through dedicated discussion times teachers enable pupils to think and talk about scientific concepts, and provide a wide range of opportunities for creative investigations and problem solving. Pupils' recording is focused, so there is always time for practical science.

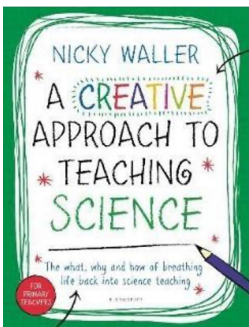
The National STEM Centre offers a TDTS approaches course at York. Courses at the National STEM Centre often have bursaries, so don't be put off by course fees advertised as these may well be covered. Course fees include all meals and accommodation, and there is often sufficient in the bursary to cover travel costs too. The booking link for the 4 day course: Leading the Thinking, Doing, Talking approach in primary science, commencing 8th November 2022 can be found at <https://www.stem.org.uk/cpd/ondemand/462846/leading-thinking-doing-talking-approach-primary-science>

Alternatively, some of the strategies referred to in TDTS for conceptual understanding can be viewed through the PSTT link for Bright Ideas Time. Read more at <https://pstt.org.uk/resources/curriculum-materials/bright-ideas>

Locally TDTS Champions, Karen Carney and Grace Marson are always happy to share impact examples. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



→ **Science Across the City recommends:**  
**The key messages and creative ideas from Nicky Waller, primary science consultant and author.**



Teachers across Stoke-on-Trent have learned so much from year group science networks facilitated by the author of this amazingly helpful book. The positive impact of the Nicky Waller approach is noted in many subject reviews both through the confidence and enthusiasm of the teachers as they discuss their pedagogical choices, and in classrooms as children refer to big questions and the skills they have as 'superscientists'.

**Book Now!**

Contact [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk) to request booking links. As this is fully-funded, please include your school name for local eligibility check. Stoke-on-Trent and Staffordshire schools only.

19<sup>th</sup> September 09:30 (Y1) 19<sup>th</sup> September 13:00 (Y2)

20<sup>th</sup> September 09:30 (Y3) 20<sup>th</sup> September 13:00 (Y4)

21<sup>st</sup> September 09:30 (Y5) 21<sup>st</sup> September 13:00 (Y6)

Inspirational- I am super excited to start teaching science properly.

As a result children have a confidence boost.

We had to buy more Nicky Waller books as teachers were fighting over them.

Role play helped to create sticky learning.

Locally to discuss the ideas from Nicky as tried in real classrooms contact Andie Hughes KS1 and Karen Carney KS2. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



■ **How do I ensure practical work is carried out safely and effectively?**

→ **Science Across the City recommends:**  
**CLEAPSS (Consortium of Local Education Authorities for the Provision of Science Services)**



Never forget, CLEAPSS is hugely important for all subject leaders to know about! CLEAPSS provides general advice and support for all aspects of practical work with an overarching focus on health and safety.

Through membership of CLEAPSS, employers discharge their responsibilities under the Health and Safety at Work Act and subsequent regulations. While health and safety are paramount, high quality practical work can do much to inspire pupils and CLEAPSS aims to support teachers with exciting, engaging and safe practical activities.

Search the CLEAPSS website for **teaching ideas, pupil competitions** as well as how to **do practical work safely**, and it isn't just science either, other practical areas of the curriculum are covered too.

Governors and trustees should be aware of their responsibilities with regard to safety and would find it useful to discover the benefits of belonging to CLEAPSS at <https://science.cleapss.org.uk/Resource/Academies-Reasons-for-belonging-to-CLEAPSS.pdf> as well as information on how to join.

I have used the list of primary recommended resources to audit my science cupboard and request essential stock that we didn't have.

There are various ways to contact CLEAPSS which can be found at <https://primary.cleapss.org.uk/contact-us.aspx>





## Reflecting on teaching and learning strategies

**What to do:** Explain to colleagues this is to find out the range of teaching and learning strategies used during science lessons and to get them thinking about the effectiveness of these strategies. Ask colleagues to tick boxes to indicate the regularity with which the strategies are used and comment on their effectiveness. They should also add any strategies they use that are not included.

**What next?** Once you have looked at the completed sheets you will be aware of which strategies are used, how regularly, and how effective your colleagues believe these to be. You may begin to consider if new strategies should be introduced, or whether wider sharing of the existing range of strategies might be appropriate. You may have some thoughts on which strategies are proving most and least effective and can use this information to support action planning.



Teaching and learning approach		Use regularly	Use sometimes	Never use	Comments on effectiveness of strategies or other strategies used
<b>Talk and higher order questions</b>	Concept cartoons				
	Explorify				
	card sort				
	Talk partners				
	Think, pair, share				
<b>Developing vocabulary</b>	Vocabulary games				
	Vocabulary displayed				
<b>Drama/role play</b>	Hot seating				
	Drama scenarios				
	Role play (e.g. particle model)				
	Dance (e.g. attract, repel)				
<b>Exploration</b>	Time to 'play' with artefacts (e.g. leaves, magnets, circuit components)				
<b>Assessment for Learning</b>	KWL grids				
	Mind maps				
	Self assessment				
	Peer assessment				
	Mini plenaries				
<b>Multi- sensory activities</b>	Making models (e.g. solar system)				
	Using range of senses (e.g. smell, touch)				
	Outdoor learning				

# How can I enrich and deepen science learning to prepare children for their future success?

## Connecting the curriculum

“ Cultural Capital: ... the essential knowledge that pupils need to be educated citizens, introducing them to the best that has been thought and said, and helping to engender an appreciation of human creativity and achievement.”

Ofsted handbook in 2019, paragraph 20

### Ponder :

- How do I encourage pupils to read, analyse and talk like scientists?
- Where do I find ways to increase cross-curricular opportunities?
- How do I promote STEM as useful to broaden future career horizons?
- How do I find resources to support informal or extra-curricular learning?

### ■ How do I encourage pupils to read, analyse and talk like scientists?

→ **Science Across the City recommends:**  
**EEF guidance toolkits for Reading and Improving Mathematics and the associated local forums known as BR:BS (Better Reading: Better Science) and BM:BS (Better Maths: Better Science)**

The Better Reading: Better Science OA primary science practitioner research group had a huge impact on the Science Influencers involved. By exploring the EEF guidance on reading and applying it to science contexts, teachers were able to better support children in being ‘word ready’ for the upcoming science topics. Teachers are now thinking more carefully about which books to select for guided non-fiction reading, and for the fit to the content of the science topic that term.



<p><b>1</b></p> <p><b>Develop pupils' language capabilities</b></p> <ul style="list-style-type: none"> <li>• Purposeful speaking and listening activities support pupils' language development. Purposeful activities include:                     <ul style="list-style-type: none"> <li>— collaborative learning activities where pupils can share their thought processes;</li> <li>— reading books aloud and discussing them, including use of structured questioning; and</li> <li>— pupils articulating their ideas verbally before writing.</li> </ul> </li> <li>• Promote high quality dialogue in the classroom, between the teacher and the pupils and between pupils, to support pupils to develop their thinking and use of language.</li> <li>• Extend pupils' vocabulary by explicitly teaching new words, providing repeated exposure to new words, and providing opportunities for pupils to use new words.</li> </ul>	<p><b>2</b></p> <p><b>Support pupils to develop fluent reading capabilities</b></p> <ul style="list-style-type: none"> <li>• Fluent reading supports comprehension because pupils' cognitive resources can be redirected from focusing on word recognition to comprehending the text.</li> <li>• Develop pupils' fluency through:                     <ul style="list-style-type: none"> <li>— guided oral reading instruction—teachers model fluent reading, then pupils read the same text aloud with appropriate feedback; and</li> <li>— repeated reading—pupils re-read a short and meaningful passage a set number of times or until they reach a suitable level of fluency. Prioritise understanding pupils' current capabilities and teaching accordingly. Most pupils benefit from an emphasis on reading fluency in Key Stage 2 but some may continue to need support with foundational reading capabilities such as decoding.</li> </ul> </li> </ul>	<p><b>3</b></p> <p><b>Teach reading comprehension strategies through modelling and supported practice</b></p> <ul style="list-style-type: none"> <li>• Teach specific strategies that pupils can apply to monitor and overcome barriers to comprehension. These include:                     <ul style="list-style-type: none"> <li>— prediction (based on text content and context);</li> <li>— questioning;</li> <li>— clarifying;</li> <li>— summarising; and</li> <li>— activating prior knowledge.</li> </ul> </li> <li>• Model and scaffold these strategies; then support pupils to increasingly use reading comprehension strategies independently, with less and less prompting from the teacher.</li> <li>• Texts should be carefully selected to support the teaching of these strategies.</li> </ul>	<p><b>1</b></p> <p><b>Develop practitioners' understanding of how children learn mathematics</b></p> <ul style="list-style-type: none"> <li>• Professional development should be used to raise the quality of practitioner knowledge of mathematics, of children's mathematical development and of effective mathematical pedagogy.</li> <li>• Developmental progressions show us how children typically learn mathematical concepts and can inform teaching.</li> <li>• Practitioners should be aware that developing a secure grasp of early mathematical ideas takes time, and specific skills may emerge in different orders.</li> <li>• The development of self-regulation and metacognitive skills are linked to successful learning in early mathematics.</li> </ul>	<p><b>2</b></p> <p><b>Dedicate time for children to learn mathematics and integrate mathematics throughout the day</b></p> <ul style="list-style-type: none"> <li>• Dedicate time to focus on mathematics each day.</li> <li>• Explore mathematics through different contexts, including storybooks, puzzles, songs, rhymes, puppet play, and games.</li> <li>• Make the most of moments throughout the day to highlight and use mathematics, for example, in daily routines, play activities, and other curriculum areas.</li> <li>• Seize chances to reinforce mathematical vocabulary.</li> <li>• Create opportunities for extended discussion of mathematical ideas with children.</li> </ul>
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To find out more about BR:BS see <https://www.scienceacrossthecity.co.uk/connect-issue-2/>. The Science Influencers involved set up a professional reading book club using the texts: Closing the Reading Gap and Closing the Vocabulary Gap, by Alex Quigley, as a focus for reflection and ponders. Both of the recommended texts are worth revisiting on a regular basis as confidence and practitioner reflective thinking develop.

For further general strategies and approaches, including free resources that stimulate new thinking, follow Alex Quigley and his work at <https://www.theconfidentteacher.com>

Pupils hear words in several ways in a variety of context. This helps them to really 'know' the word and to practice using it correctly within sentence.

The Better Maths: Better Science OA forum, as a result of their thinking, realised the need for a progressive map to show not only where maths fitted into different topics but also how the maths in science this year, builds on the maths used in science last year. An example page is included in the journal. A full set of year group BM:BS maps are available at <https://www.scienceacrossthecity.co.uk >Useful Tools> Linking maths with science>

In response to Where's the maths in that? well now we have an at a glance grid. Easy. Saves lots of time

Having been exposed to the science knowledge and vocabulary in detail during shared reading. I found the children were given a head start during their science lessons.

Locally to discuss BR:BM:BS contact Adam Lowell, Julie Rowe and Luci Baker. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



→ Science Across the City recommends: **The Royal Society**

**The Royal Society Young People's Book Prize** aims to inspire young people to read about science. Funded by the Royal Society, a selection of science books for children are posted directly to your school. Children, usually from Upper Key Stage 2, form a judging panel and take their role seriously as they systematically review, comment and provide feedback. Being nominated for the prestigious prize is important to the authors of the books, and the children are aware of this status and the significance of their views. This annual competition is a real win for schools developing reading for purpose, seeking to engage families in reading diverse genres, and you get to keep the books for your school library too. See <https://royalsociety.org/grants-schemes-awards/book-prizes/young-peoples-book-prize/judging-panels>



Royal Society Partnership Grants fund schools up to £3,000 to run investigative STEM projects in partnership with scientists. Some teachers worry that the size of the grant means this will be a complicated process, but to make life easier, there are case studies on the website and locally Stoke-on-Trent is very fortunate to have a teacher adviser supporting schools to develop a project and get started.

The book prize is such a win-win. Why would anyone not do it?!

I'm interested but a bit nervous about the partnership grants, so I am going to talk to a local champion for ideas before I apply.

Locally to discuss the offers from the Royal Society contact Dawn McCann, Tracey Moller, Lucy Holdcroft and Becki Price. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



■ Where do I find ways to increase cross-curricular opportunities?

→ Science Across the City recommends: **The Royal Society of Chemistry (RSC)**



The Royal Society of Chemistry posters, 'Not all scientists wear white coats' can be seen in many classrooms. As well as career linked materials, there are resources to help teachers develop their subject knowledge, and bring chemistry into other areas of the curriculum. The topic webs are mentioned by subject leaders as making the links seem so straightforward. Some schools use these for engaging themed days. See <https://edu.rsc.org/primary-science/science-ideas-webs/4013259.article>

■ How do I promote STEM as useful to broaden future career horizons?

→ Science Across the City recommends: **Nu-STEM**

NuSTEM is based in the North-East of England at Northumbria University and works with a number of local schools, however their website includes a range of support for science subject leaders and teachers. Their **STEM Person of the Week**<sup>1</sup>, a five week programme, has been shown to influence children's attitudes to science careers.

Currently causing great excitement amongst EYFS teachers are the tools focussed on a job role with activities and guidance for very young children. Broadening aspiration and conquering bias starts with positive early experiences and exploration. Check out <https://nustem.uk/eyfs/meteorologist/>

NuSTEM helps develop aspirational links.

I cant wait to tell other EYFS leaders that there is something so useful for us too!

→ Science Across the City recommends:

**My Everyday Science Cards by Jenny Watson**



My Everyday Science Cards, available on the TES website (<https://www.tes.com/teaching-resources/shop/jennywatson>) written by Dr

Jenny Watson, were found to be so user friendly that Stoke-on-Trent Science Influencers requested hard copies. Now teachers can flick through to find simple practical ideas, each with a linked scientist. SATC teachers remain very grateful to Jenny for her generosity in helping to reduce their workload.

Locally to discuss scientist links to curriculum contact Becki Price and Karen Carney. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



→ Science Across the City recommends:

**Linking with and requesting STEM Ambassadors**



Available on the STEM Learning website, <https://www.stem.org.uk/stem-ambassadors>, teachers can request, free of charge, a DBS checked STEM professional

to visit their classes. Over 37,000 volunteers have signed up across the UK, so complete your request on the STEM Learning website to find a visitor relevant to your next science topic.

Locally to discuss STEM Ambassadors in practice contact Becki Price. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



■ How do I find resources to support informal or extra-curricular learning?

→ Science Across the City recommends:

**The Great Science Share for Schools (GSSfS), Space Camps, British Science Week and the local innovation- The Curiosity Club**



The Great Science Share is a national campaign to inspire young people to share their scientific questions with new audiences preferably on, or around, the same day in mid-June. It is based on three values:

- 1) bringing child-led science communication to new audiences,
- 2) being inclusive and non-competitive, and
- 3) promoting collaboration.

There are resources that help to build better understanding of the enquiry cycle. See [www.greatscienceshare.org](http://www.greatscienceshare.org).

The children (well all of us) love Dr Chips!

The new video clips helped me to understand what makes a great conclusion - I can teach my children better because I get it!

Parents like to join in the GSSfS as it links our school to what others are doing too- and we present the quality certificates for high profile too.

Locally to discuss GSSfS contact local champion Grace Marson. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



Space Camp  
Do you have what it takes?

Space Camps are residential learning experiences, immersing children in the world around them without any need for transport, as the camp simply utilises your own school environment and facilities. Children bring their pyjamas and overnight bag. Tents can be set up in the hall or, for the brave, in the grounds. Resources and ideas of what to do at camp to focus on the amazing world of space can be found at [http://www.spacecampuk.com/uploads/1/5/1/6/15168764/space\\_camp\\_guide.pdf](http://www.spacecampuk.com/uploads/1/5/1/6/15168764/space_camp_guide.pdf)

Locally to discuss availability for the loan of SATC SPACE CAMP KIT including tents, sleeping bags and telescopes, contact Dawn McCann and Karen Carney. Schools that have experienced a space camp include OLSB, Heron Cross, Hillside, St John's, Sandford Hill, and The Willows. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



Curiosity Club was a local initiative across Stoke-on-Trent with twenty schools all working on the same theme and activity for UKS2 pupils over a ten-week programme. Collaboration brought many benefits including children being able to visit each other's clubs and reduced workload for teachers. The great success of the Curiosity Club can now be shared more widely because all the resources can be found at <https://www.scienceacrossthecity.co.uk/curiosity-club/>

Locally to discuss and have access to the shared folder of club resources contact Becki Price. Contact details through [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)



Two science clubs joined forces with a real visit to each other's clubs- It was mint.



# SATC Better Maths: Better Science

By Luci Baker, Belgrave St Bartholomew's

Year Three	Number: Place Value, 4 Operations & Fractions	Geometry: Shape	Measures: Length & Perimeter, Mass & Volume, Money & Time	Statistics
<p><b>Plants</b></p> <ul style="list-style-type: none"> <li>- identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers</li> <li>- explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant</li> <li>- investigate the way in which water is transported within plants</li> <li>- explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</li> </ul>	<ul style="list-style-type: none"> <li>- Report the effects of the different conditions using their multiplication and division facts or fractions, e.g. The plant with no water was 3 times smaller (or a third of the size) of the plant with water.</li> </ul>	<ul style="list-style-type: none"> <li>- Discuss how different seed shapes make them better for different types of seed dispersal.</li> </ul>	<ul style="list-style-type: none"> <li>- Use standard units (cm and mm) to measure the effects of different conditions for growth.</li> </ul>	<ul style="list-style-type: none"> <li>- Record findings of different growth conditions in a table and on a graph.</li> </ul>
<p><b>Animals inc. Humans</b></p> <ul style="list-style-type: none"> <li>- identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat</li> <li>- identify that humans and some other animals have skeletons and muscles for support, protection and movement.</li> </ul>	<ul style="list-style-type: none"> <li>- Look at the nutrition tables on food packaging; compare the nutritional value of different foods.</li> <li>- Compare the average height of 7 year olds in Britain compared to children in Africa or areas of the world where children are malnourished.</li> </ul>	<ul style="list-style-type: none"> <li>- Think about how the shape of the different bones in our skeleton help them to do their job.</li> <li>- Use positional language to identify where bones are located.</li> </ul>	<ul style="list-style-type: none"> <li>- Investigate the lengths of different body parts, e.g. do all children who are 7 have the same length arms?</li> <li>- True or false: the longer your legs, the further you can jump? Use cm and mm to accurately measure jump length.</li> </ul>	<ul style="list-style-type: none"> <li>- Use a table to collect data about different limb lengths.</li> <li>- Investigate do people with the longest legs jump the furthest? Record and create a bar chart to show the findings.</li> </ul>
<p><b>Light</b></p> <ul style="list-style-type: none"> <li>- recognise that they need light in order to see things and that dark is the absence of light</li> <li>- notice that light is reflected from surfaces</li> <li>- recognise that light from the sun can be dangerous and that there are ways to protect their eyes</li> <li>- recognise that shadows are formed when the light from a light source is blocked by a solid object</li> <li>- find patterns in the way that the size of shadows change.</li> </ul>	<ul style="list-style-type: none"> <li>-Use the data collected from a shadow investigation to spot patterns, e.g.</li> </ul> <p>The shadow increased by 2 cm between 1pm and 2pm.</p>	<ul style="list-style-type: none"> <li>-Discuss the changes in the shape of shadows throughout the day</li> </ul>	<ul style="list-style-type: none"> <li>- Measure the length of shadows formed at different times of the day (cm and mm).</li> <li>- Draw around a shadow to look at how the size of the shadow changes. N.b area not taught until year 4.</li> </ul>	<ul style="list-style-type: none"> <li>-Plot the shadow size in a bar chart to look for patterns in the</li> </ul>
<p><b>Rocks</b></p> <ul style="list-style-type: none"> <li>- compare and group together different kinds of rocks on the basis of their appearance and simple physical properties</li> <li>- describe in simple terms how fossils are formed when things that have lived are trapped within rock</li> <li>- Recognise that soils are made from rocks and organic matter.</li> </ul>	<ul style="list-style-type: none"> <li>- Calculate the differences between the friction data to support conclusions, e.g.</li> </ul> <p>I know that the car travelled over the tiles 10 seconds faster than over the carpet.</p>	<ul style="list-style-type: none"> <li>- Sort rocks based on their properties, record in a simple table</li> </ul>	<ul style="list-style-type: none"> <li>- Explore different soils by investigating the volume of water each one absorbs.</li> </ul>	<ul style="list-style-type: none"> <li>- Create a Carroll diagram to show differences and similarities in different types of rocks.</li> </ul>
<p><b>Forces &amp; Magnets</b></p> <ul style="list-style-type: none"> <li>- compare how things move on different surfaces</li> <li>- notice that some forces need contact between two objects, but magnetic forces can act at a distance</li> <li>- observe how magnets attract or repel each other and attract some materials and not others</li> <li>-compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials</li> <li>- describe magnets as having two poles</li> <li>- predict whether two magnets will attract or repel each other, depending on which poles are facing.</li> </ul>	<ul style="list-style-type: none"> <li>- Calculate the differences between the friction data to support conclusions, e.g. I know that the car travelled over the tiles 10 seconds faster than over the carpet.</li> </ul>	<ul style="list-style-type: none"> <li>- Sort everyday objects into whether they are attracted to a magnet or not.</li> </ul>	<ul style="list-style-type: none"> <li>- Measure the friction between different shoes and surfaces using a Newton metre. Phizzi enquiry: slippy shoes   The Ogden Trust</li> </ul>	<ul style="list-style-type: none"> <li>- Record findings in a table.</li> <li>- Represent on a bar graph.</li> <li>-Create a simple table to predict and then test whether magnets will repel or attract each other.</li> </ul>

The above is a sample page from the BM:BS mapping tools. Find the full set BM:BS by year group (year1-6) at <https://www.scienceacrossthecity.co.uk>



# Local “go to” map

Theme	Leadership inc Monitoring	Assessment inc Moderation	Connected Curriculum inc reading & Maths	Curriculum progression inc enquiry	Enriched Curriculum inc space camp	Inclusive Curriculum inc careers
Becki Price @ The Willows	•	•		•	•	
Julie Rowe @ Alex Juniors			•			
Ben Leighton @ Newford						•
Dawn McCann @ Hillside	•	•	•		•	
Luci Baker @ Belgrave	•	•				•
Andie Hughes @ Rushton Spencer	•	•		•		•
Emily Royall @ St Maria Goretti	•					*
Karen Peters @ Moorpark	•			•		
Ash Jones @ Milton	•	•		•		
Karen Carney @ Sandford Hill	•			•	•	
Adam Lowell @ Burnwood		•	•			
<b>Science independent consultants</b> Quality assured by local schools through active engagement in the OA project						
Tina Whittaker	•	•		•		
Grace Marson	•			•	GSS	
Jenny Watson	•	•	•	•	•	
Scott Walker				•	•	•
Nicky Waller		•		•		
Jane Winter		EYFS		EYFS		
Sarah Earle		•		•		
Jules Pottle			•			
Clare Warren	•			•		•

To get in touch with any of the teachers and consultants named above please email [info@scienceacrossthecity.co.uk](mailto:info@scienceacrossthecity.co.uk)

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