

# CONNECT

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

**ISSUE 3: LEARNING COMMUNITIES**

AUGUST 2021



\* Please note the cover images were taken before March 2020

### Moorpark Junior School, Burslem

Turning a passion for science into a vision for science, Moorpark Junior School is the fund holder and heart of Science across the City. It is significant to the project success that Karen Peters, headteacher at Moorpark and Primary Science Teaching Trust Fellow, is recognised amongst her peers as highly credible in all things primary science, whilst also empathetic to the real needs of schools in similar contexts.

### Looking ahead: Future issues are already in the making.

Contributions from local schools and teachers are always welcome. To find out more or express interest in contributing to future issues- Contact Olivia Stanyer [ostanyer@moorparkjunior.co.uk](mailto:ostanyer@moorparkjunior.co.uk)

<b>Issue 4</b>	Innovation from Stoke-on-Trent	Gifting and sharing new developments in science. Celebrating creative problem solving from teachers working collaboratively.
<b>Issue 5</b>	Head Teachers reflect on policy influencing practice.	Head Teachers relate their experiences of the SATC project to informative publications related to primary education.
<b>Issue 6</b>	Are we nearly there yet?	Science subject leaders reflect on just how far they have come since they submitted their PSQM evidence in the spring of 2019

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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With gratitude to teachers from the following schools for their contributions in this journal by providing a professional voice reflecting upon the impact of CPD on practice.

**Priory CofE Primary School, STAR Academy, Moorpark Junior School, The Willows Primary School, Hillside Primary School, Newford Academy, Milton Primary Academy, St Mary's Catholic Academy, The Meadows, St Gregory's Catholic Academy, Forest Park Primary, Christchurch CofE Primary Academy, Stoke Minster Primary Academy, Abbey Hulton Primary School, Sandford Hill Primary School and Kingsland CofE Academy.**

# Building Successful Communities for Primary Science



**Tina Whittaker,**  
National Consultant  
for Primary Science,  
Co-lead of SATC.



**Karen Peters,**  
PSTT Fellow, Headteacher  
Moorpark Junior School,  
CEO New Guild Trust,  
Co-lead of SATC



## Why Does Community Matter?

**Our natural human desire is to connect with other people and to seek a sense of belonging. Throughout the developmental journey of Science Across the City, people and making links between them, have been at the heart of every decision. A vision of a community of science enthusiasts from every primary school, connected by their commitment to professional learning, was key to increasing school to school support and a professional culture that would enable on-going development even once the funding is a distant memory. Through the creation of communities, we aspired for Stoke-on-Trent teachers to feel valued and to value others, to question without fear, and engage in challenging dialogue focussed on pupil impact.**

## Types of Community

Various types of communities are defined here and Science across the City team is proud to have established all of the types of communities described.

- **Communities of interest:** people who meet around a shared passion. To this end Science across the City provided:
  - The Digging Deeper Series with focussed meets to explore resource offers from the STEM sector. Examples included Practical Action, ESEA, CLEAPSS.
  - The Quick Win Series with specific focus on kit and teaching tricky topics. Examples included RSC Chemistry for year 5 and Ogden Trust.
  - The more recent focussed 'Science Meets', as a COVID response, whereby teachers could 'jump on a Zoom' and unpick a specific issue., Examples included effective remote learning, and new Ofsted research summaries.

- **Communities of place:** people who have a connection to the area they live in. To this end Stoke-on-Trent teachers share an empathy for the people affected by the socio-economic factors that make it part of an Opportunity Area. Science Across the City sought to shine a spotlight on local success and build a community that was proud and loud.
- **Communities of action:** people who gather around a cause or specific event. Examples of this in the Science Across the City offer would include the collective science week in March 2021 with the consistent theme of 'potter-bots' in every school, and the year 6 BEST diagnostics with over three thousand children completing the same 10 questions to support curriculum planning in year 7.
- **Communities of practice:** groups of people who not only share a concern or passion for something that they do but that they also learn how to do it better as they interact regularly. The term community of practice was used by Jean Lave and Etienne Wenger in 1991<sup>1</sup>. The importance of regular interaction across a community of teachers wanting to do something better was core to the programme design of Science Across the City.

All schools in the city of Stoke-on-Trent were encouraged, through the SATC campaign, to select the communities of practice that would make the biggest difference to them. For schools wanting to strengthen subject leadership (78%), PSQM hubs in the city provided a sustained and facilitated community; for schools wanting to improve science assessment (61%), a TAPS four day learning community was hosted in the city; for those schools aiming to build a wider pedagogical repertoire (62%), TDTS facilitated their four day programme; and for those seeking to develop the application of reading strategies

in science (19%), the BR:BS practitioner research forum was created.

Since March 2019 over 80% of the city's primary schools have enabled teachers to attend CPD led by national experts, sustained over time, with a minimum of three days' duration, and supported by local context champions. This model, offering wide coverage and choice of CPD, built on the concept of communities of practice, was only viable thanks to significant funding from the DfE Opportunity Area grant. The legacy of this investment is anticipated to be evident through the sustained impact on pupil outcomes.

Like all good things, effective communities take a lot of time and effort, but the benefits of accelerated personal development, better knowledge transfer, increased trust, and improved communication, make for better classroom practices, happier people, and the breakdown of silos. In addition, they facilitate staff retention in the interest area of primary science education, and in the locality of Stoke-on-Trent. This issue of CONNECT sets out to share the voices of community members. Whilst attendance at events shows clearly the high take up and engagement in the concept of learning communities, for the true 'so what' of community membership we need to focus on the qualitative, evaluative reflections and evidence presented by the authors of the articles in this Journal.

## So what, so what, so what!

We are immensely proud of what our teachers are now telling us about the impact on their pupils, and through this issue of CONNECT we want to give them the opportunity to have their voices heard more widely.

**Karen Peters & Tina Whittaker**  
(Co-Leads for SATC)



<sup>1</sup> Lave, J. and Wenger, E (1991) *Situated Learning*. Cambridge University Press

# Reflections from the Editor

In the very first article of this third issue of CONNECT Tina and Karen ask the question, “Does community matter?” For me the rest of the journal answers this question with a resounding YES! Having read with fascination each of the articles in this journal it is clear that communities are at the heart of the improvements in science teaching and learning that are transforming primary science education across Stoke-on-Trent.

The first article focuses on the collaborative and sustained nature of the TAPS CPD, along with the range of TAPS resources, that have enabled schools to develop their science assessment practices according to their needs. Many of the science subject leaders eloquently describe the impact in their schools. For those primary teachers who have not yet explored the wealth of resources on the TAPS website, a visit to <https://pstt.org.uk/resources/curriculum-materials/assessment> would be time well spent.

Stories of development of primary science leaders and teachers is the primary focus of this issue but pages 10 and 11 present a very different perspective focusing on the numbers that reflect many of the projects’ successes. It has prompted me to consider that there must be so many more stories of success that this journal will never be able to tell. However, if you have an impact story to share, please do so.

Our third article celebrates the successes of schools that recently achieved a Primary Science Quality Mark as well as those schools that are on similar journeys. The teachers’ thoughts included in this article demonstrate to me that PSQM is so much more than a badge. The science subject leaders who contribute to the article present their own perspectives on how PSQM has supported them personally to develop as a science subject leaders, in addition to developing science teaching and learning in school. I was delighted to read that two new PSQM Hub Leaders have been mentored locally so that Stoke-on-Trent schools will be able to accredit and reaccredit with PSQM for many years to come.

A very different community is the subject of ‘What matters to children’. Gemma Coward, along with her pupils, describes how the whole year 6 class became Abbey Hulton Primary School’s Science Council and collaborated to review books deciding if they were right for their class and the school library. The enthusiasm of



Clare Warren

pupils leapt off the page at me and I hope that in September the new year 6 pupils will take up the mantle.

The fifth article concerns the Thinking, Doing, Talking Science Project which was a successful Endowment Education funded project and, based on the experiences of local teachers, Dan Jones and Teresa Barrett, it has been equally successful in Stoke-on-Trent. Helen Wilson, who facilitated the programme, comments on the value of ‘Champions’. For me these Champions have been facilitating ‘Thinking, Doing, Talking Primary Science Education’ to support teachers across the City to ensure their pupils are ‘Thinking, Doing, Talking Science’. I suspect Tina and Karen planned it that way – how clever!

Nurturing a community of SPOTYs (School Physicists of the Year) is the focus of the final article. This collaboration from SATC, Keele University and the Ogden Trust has seen magnificent growth in the quality and quantity of nominations for these prestigious awards. These awards aim to build the physics identity and aspirations of pupils, and fingers crossed they will go on to study STEM subjects be great future assets for the local and national economies, as well as having rewarding careers.

And finally, where would Tina be without her badges (See them on the back cover)? I hope this issue of CONNECT, along with previous and future issues, provide the answers to the questions posed to encourage critical reflection on the impact of Science across the City.

# The Stoke TAPS story so far

Dr Sarah Earle and Allie Beaumont



The Teacher Assessment in Primary Science (TAPS) project is based at Bath Spa University and funded by the Primary

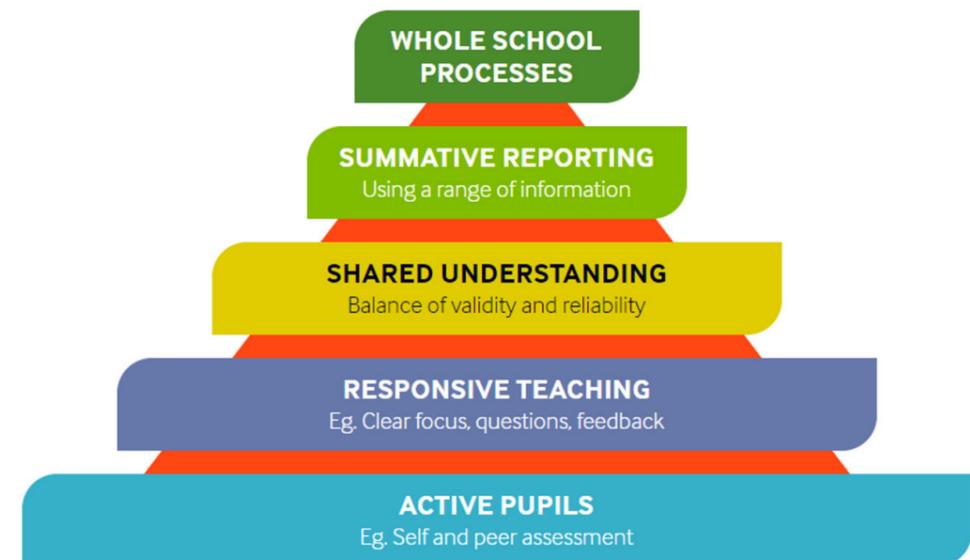
Science Teaching Trust. TAPS has worked collaboratively with teachers across the UK since 2013, to develop support for teaching and assessment. Resources include Focused Assessment activity plans and work samples, together with a Pyramid model that can be used as a source of examples or a self-evaluation tool. We have increasingly found that sustained professional learning opportunities help to get the most out of the TAPS resources, and we have used a range of training formats as part of Stoke-on-Trent’s Science across the City strategy.

Stoke TAPS began in March 2019 with trialing of the 3-day Focus4TAPS CPD programme, which is currently the subject of a large Education Endowment Foundation trial across England. More recently, the

CPD programme moved online, with the opportunity for teachers to join either Focus4TAPS training or the Stoke reflective group, or both! Next year, there will be further opportunities for online training, together with a new Stoke moderation development group, who will help to create exemplification and moderation training materials for Stoke and beyond.

## Impact on teachers and pupils

Many teachers find the best place to start with TAPS is with the Focused Assessment activity plans. For example, Leigh-Anne Eptlett, at Star Academy, trialed the materials in her own class before disseminating to the rest of the school, so that she could talk from experience. Introducing these plans and the Working Scientifically Wheel in a staff meeting has helped to provide a focus for enquiry, so that teaching, assessment and any pupil recording is on the selected skill and/or concept. Leigh-Anne is finding that there is more time for practical science and making connections in learning, with lessons building on prior learning.



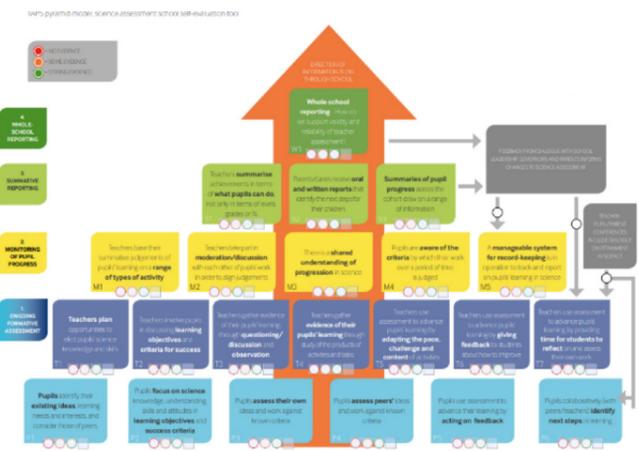
**Julie Clarke, at The Priory,** found that the TAPS plans have helped her staff feel more confident about planning and moderating work, “what ‘good’ looks like”. By focusing on one aspect or skill per lesson, which can then be recorded on the Working Scientifically Wheel, this ensures that all skills are covered through the year (and gaps are easily identifiable), so that the next teacher is informed of progress. The more focused recording (e.g. where the focus is on ‘results’, a table might be recorded in books, with discussion of other elements), “allows more time for more investigations, which means happy pupils and easier assessment”.

Introducing the Focused Assessment plans through a staff meeting, **Lucy Holdcroft, from Moorpark Junior School,** shared examples of her practice with colleagues. She then asked the teachers to trial one of the plans with their class and feedback. She said that teachers found them useful because they were practical, clear and explicit in terms of what good practical science looked like. The TAPS plans are used to assess Working Scientifically skills and are now embedded into her school’s medium-term planning, so that they are part of the sequence of learning. Lucy has found that pupils are more enthusiastic and that their questioning and other science skills have, “made them more of a scientist, we definitely work more scientifically now”.

**Becki Price, at The Willows,** also found that science teaching and feedback has become more focused. TAPS was first introduced through a whole school science day, where a rocket mice investigation was carried out, with older children supporting younger pupils. Since their introduction, staff plan to do a Focused Assessment task during each unit, to support coverage and development of Working Scientifically skills. With only one element recorded at a time, Becki has found that the children are generally doing more in the lesson, asking their own questions and talking about what kind of scientist they have been. Becki and her colleagues have also developed a greater awareness of formative assessment, for example, finding out what the children know using strategies like the discussion starters in Explorify.

The Focused Assessment approach has changed the way science is recorded by pupils at **Hillside Primary School,** with a greater variety of evidence noted. **Dawn McCann** advocates that the TAPS lesson plans are used at least once within every unit and “ensure that you know what you’re looking for within a practical lesson”. After introducing the Focused Assessment plans, Dawn used further staff meetings to consider different parts of the pyramid, with some staff applying the principles to other subjects too. “TAPS has really helped us to focus”. There is less emphasis on the written record, and more on the enquiry or the talk with children to find out about their thinking, which helps with assessment because there is more clarity around “what you are looking for as an outcome”.

At **New Ford Academy, Ben Leighton** has found that the planning of his science lessons has changed after considering the active pupils and responsive teaching layers of the TAPS pyramid. He plans activities that stimulate talk and questioning to elicit children’s ideas, allowing pupils time to discuss, reflect and take ownership of their learning. Ben now looks for evidence of their thinking in science and has found that the children are “eager to share their findings... more enthused, more willing to participate because of the way that perhaps my planning has changed.”



## The Stoke TAPS story so far

### TAPS Working Scientifically Wheel



### Impact across the school and beyond

**Ash Jones, from Milton Primary Academy,** has used the TAPS pyramid in his school and with schools within his academy trust, since he felt that it could support both assessment in science and is also transferable to other subjects. It was used as a self-evaluation tool allowing teachers to RAG (red, amber, green) rate their practice relating to the boxes in the pyramid, with staff then suggesting what to focus on, so that the team could develop an action plan. The pyramid tool “helped staff to develop an awareness of what effective assessment looked like and the different facets of effective assessment systems, that there was more to it than just a tracking system (on-line) almost disconnected from day to day teaching and learning”.

Cascading the TAPS training on enquiry types has enabled Ash to help staff to clarify where Working Scientifically strands can feature within these. The Working Scientifically butterfly (an early version of the Working Scientifically Wheel mentioned above) is also used throughout the school to ensure coverage of a range of skills through the year, with focused recording of one part for each investigation. Because they “focus on a small element” Ash feels that “children now have a far better conscious awareness of what it is they are learning”. Pupil voice within the school has shown learners have more positive attitudes towards science.

### Looking ahead

The teachers’ experiences above indicate that TAPS has made a positive contribution to teaching and learning in their schools and they are keen to learn more. Professional learning takes time to embed, hence the importance of sustained support through Science across the City and opportunities for more support for schools.

Furthermore, teachers across Stoke are supporting the ongoing development of the TAPS CPD and resources, and, working with teachers across the City, we are very excited to begin the collaborative development of new moderation and exemplification materials next year.

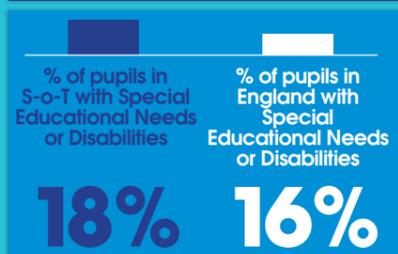
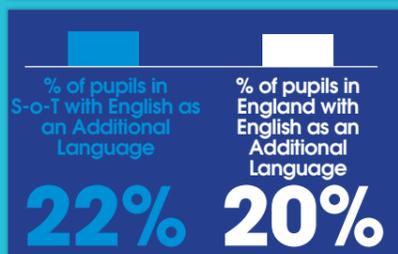
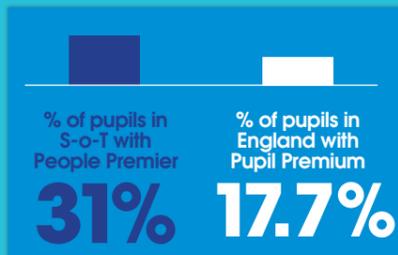
# SATC in Numbers. September 2019 to August 2021



**Olivia Stayner**

External funders quite rightly require quantitative key performance indicators (KPI). Hard data shows success of actions. The journals, of which six are planned, are the narrative behind the numbers and consider the difference made to practice and hence legacy. However KPI's matter too and it is celebratory and pleasing that targets for CPD engagement, teacher take up, repeat visitors and community memberships were in fact not only met by the SATC team but in every case go beyond expectations. Browse the at a glance summary and let the numbers speak for themselves.

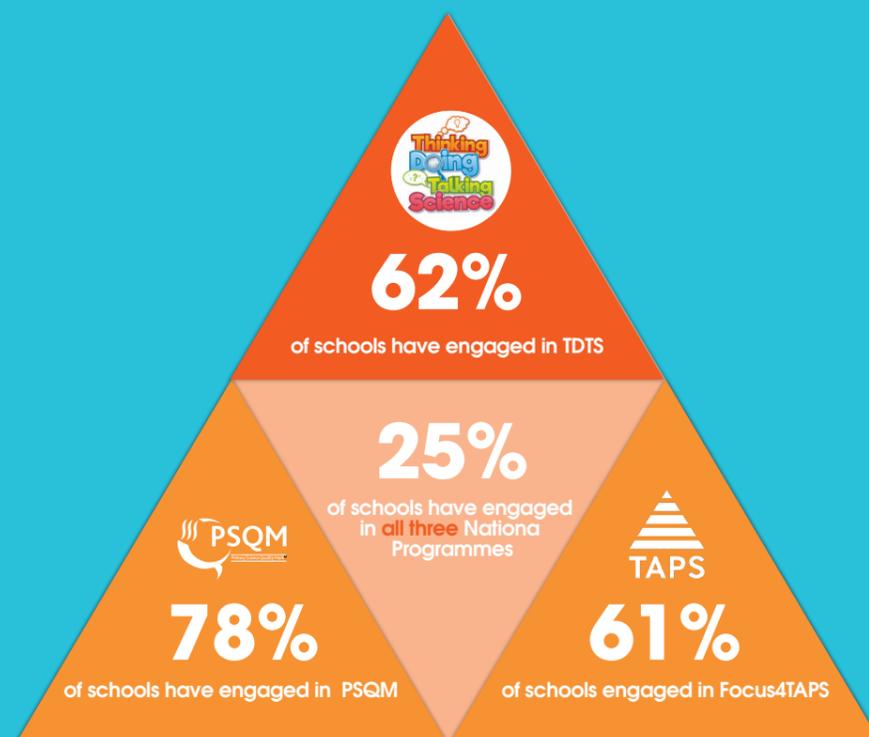
## Context/ Background



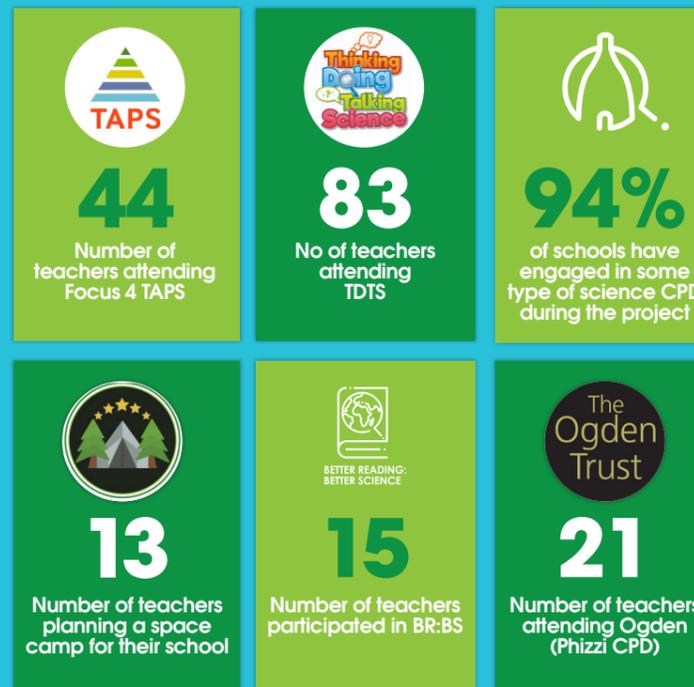
## Distributed Science Support



## School Engagement in National Programmes



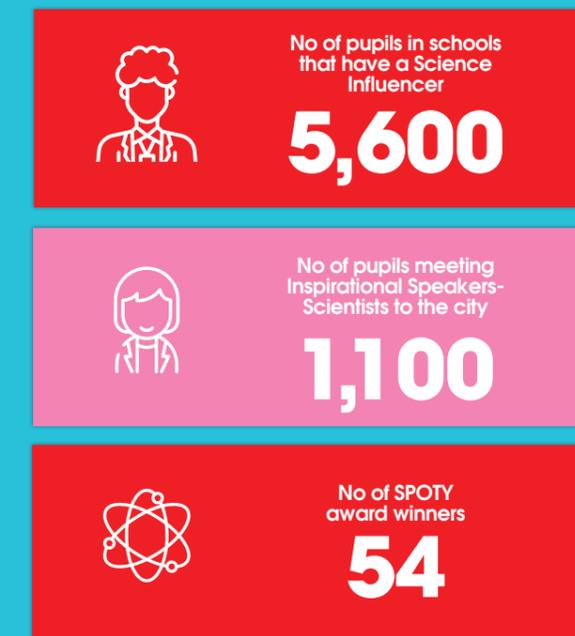
## Teacher Participation



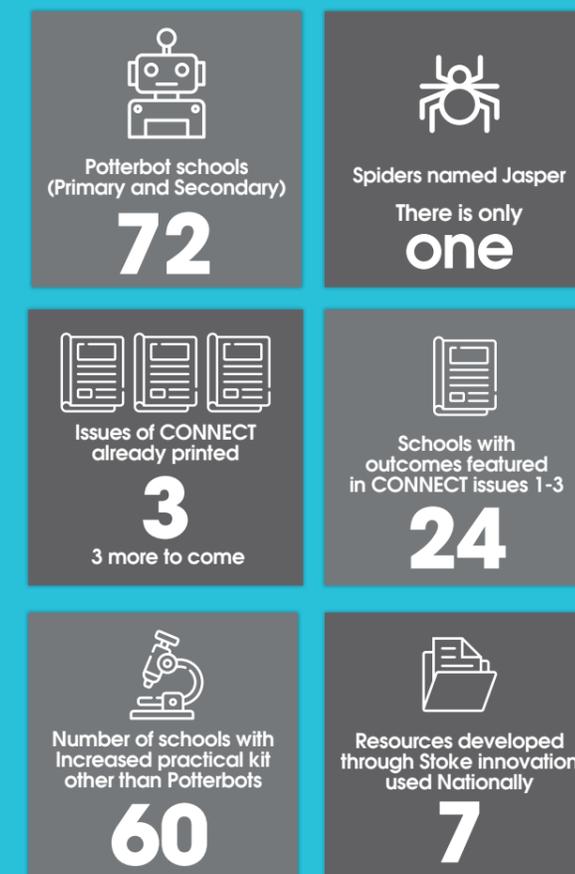
## Teacher Expertise



## Pupils



## Other



# Legacy through investment in subject leadership

Tina Whittaker

## What is PSQM?

Primary Science Quality Mark (PSQM) is a year-long CPD programme that helps schools to achieve a quality mark, whether science within the school has been a low profile for a while or the school wants to improve the provision further. It focuses on developing effective, confident science leadership for whole school impact on science teaching and learning. PSQM

- Enables science subject leaders to develop and articulate a clear intent and aspirational vision for science. The process of achieving a PSQM raises the profile and quality of science across the whole school.
- Supports subject leaders to effectively implement a curriculum for science that is informed by research evidence and best practice data. Working with an expert hub leader subject leaders evaluate current provision for science and put in place a development cycle that leads to sustained progress in science across the school.
- Ensures strong and positive impact: Children make good progress, building and consolidating their knowledge and skills, developing positive attitudes about science and its value to their lives and globally. Teachers and children enjoy their science lessons.

Extracted from [www.psqm.org.uk](http://www.psqm.org.uk)

## Why did SATC encourage schools to do PSQM as part of its Universal CPD offer?

PSQM is rooted in research, provides regular coaching and is known from first-hand experience in local schools to have a transformative impact on the mindset of subject leaders. Investing Opportunity Area funding to increase the percentage of schools engaging with the PSQM process has the benefit of legacy impact on leaders beyond the fixed term of the funding.

Furthermore, what really matters when teachers across Stoke-on-Trent engage in CPD is the difference that is made in classrooms across the city. This difference was clear in the range of evidence of impact collected in the schools (including pupil voice, teacher voice, parent voice, and pupil work samples) and submitted to the PSQM. SATC commissioned an external evaluator to review the 2020 Stoke-on-Trent PSQM submissions and report on the extent of the engagement, enablement and empowerment of science subject leaders, teachers and others throughout

the city and beyond.<sup>1</sup> A further report has been commissioned for those submitting in Spring 2021.

This integrated plan making best use of an existing dataset meant that teachers were not required to take part in any additional data collection exercises to meet the demands of funders. This was an innovative concept and has been of interest to others as a tool for reflective formal evaluation with minimal workload for teachers.

## Was the offer relevant and of interest to schools in Stoke-on-Trent?

78% of Stoke-on-Trent schools have been awarded a PSQM. This is remarkable when one considers that in England as a whole approximately 14% of schools have achieved a PSQM.

During the OA funding window eleven schools successfully completed the full PSQM cycle and have their certificate proudly displayed. A further seven schools are awaiting review and we expect their formal notifications of success will follow September 2021. Six further schools are due to commence their PSQM journey in the Autumn 2021.

## Celebrating success to date



**PSQM Gilt:**  
Milton Primary Academy, St Maria Goretti Catholic Academy, Burnwood Community Primary, Stoke Minster Primary Academy, St Gregory's Catholic Academy



**PSQM Outreach:**  
Moorpark Junior School



**PSQM:**  
Alexandra Junior School, Forest Park Primary School, Christchurch CofE Primary Academy, St Mary's Catholic Academy, The Meadows Primary School,

## What did we hear from our teachers about the difference PSQM had made in their school?

The profile of Science has increased throughout the PSQM journey. Before PSQM science was viewed as a foundation subject, often taught in blocks and not every week. Now science is taught every week, with links made to other subject areas, including English. The children talk much more confidently about science and want to engage in science learning, many taking part in activities at home.

The impact of PSQM on me as a leader is that I now feel I am fully aware of what is happening across the school, due to creating the medium term plans for each year group. For me, this means if I have been on training or find a great resource I know where this could fit into learning. This has encouraged me to actively seek training, resources and networking to ensure the school thrives further. The amount of time I can dedicate to science, the reading around the subject and the training I can engage with due to the support from my school.

I have really enjoyed being able to help staff with their planning and have received some great feedback from them in terms of how planning has been made clearer and more effective and they have appreciated all of the resources that have been shared with them to make their lives that little bit easier!

I now have not only a more thorough understanding of my subject, but greater confidence in supporting other staff members in delivering a high-quality Science curriculum. I have seen the impact our new practices are having on the pupils and am encouraged by the positive dialogue surrounding Science. I have now been able to identify further areas for improvement within our school, and have begun liaising with SLT to make improvements to our summative assessment practices, to best reflect the progress of our pupils. I have thoroughly enjoyed this process and feel it has developed me as both a teacher and leader of Science, and am excited to see how the impact of the PSQM becomes even more visible when we return to a more normal, in-school timetable.

The Science display has provided a key focal point of discussions, to inspire and engage pupils across all year groups. I feel that one of the greatest ways in which the impact of the PSQM is visible in our school, is that it was still made a priority weekly subject, even whilst the pupils were learning remotely.

The highlight of completing the PSQM process has been growing as a subject leader and enabling me to be confident enough to feel like I can be part of city wide projects. As a recognised Science Influencer for Stoke I now feel confident enough to help guide, not only my school, but also other schools on their science journeys. I am better informed and more aware of the wider STEM community and the resources that exist that we can and do utilise.

Due to the PSQM, there has been a greater emphasis on all children thinking and working scientifically. A practice-based approach, supported with frequent opportunities for discussions and questioning, is ensuring that every pupil now understands the importance of Science in their everyday lives with opportunities for experiences that will expand their Science capital and their future opportunities to have a Science-based career.

Identifying key needs for my school has enabled me to focus my journey as science lead throughout PSQM. The support I have provided to teaching staff has been based on addressing these key needs by using pupil surveys, book and planning monitoring and data. Children are talking much more in science, using key vocabulary and the quality of science questions that children are generating has improved. Introducing floor books has been an enormous success as they underpin focussed science teaching and learning. A pupil survey highlighted the fact the children are enjoying science more as lessons are science focussed rather than producing lots of writing.



## Legacy through investment in subject leadership

When planning lessons, in science as well as other subjects, my ideas for teaching and learning have become more focussed. When monitoring teacher's planning and discussing how to evidence lessons, my first go to question is so what? Why are children learning this? What impact will it have on their learning?

A lot more practical lessons are taking place. The highlight was seeing the children become independent learners. The children enjoy being in control of their own learning. Writing their own questions and planning an investigation to answer their question. When the children are actively involved they are more likely to be engaged and remember what they have learnt.

PSQM and lock-down have enabled me to have time and access to participate in my own CPD as well as encouraging other staff. We have been forced to think outside the box in terms of teaching and explore what is really important as well as making the most of colleagues and groups discussing effective practice.

The moment which most stands out was reading the current Pupil and Staff Voice comments. To hear the positive impact the PSQM has had throughout the school has shown me that Science is not just another subject on the timetable – it is a much-anticipated and enjoyed time, where the pupils and staff alike are enjoying the opportunity to question, explore and discover the wonders of science together.

### What sustainable changes have happened in the city resulting from the focus on PSQM?

In addition to the benefits of the PSQM as described in the teacher voices above, there are now two additional fully accredited PSQM hub leaders. Two Science Influencers that have been mentored during the SATC phase and are now running their own hubs, increasing capacity locally for effective subject leadership support. The future looks very bright for PSQM success and generations of primary science learners in Stoke-on-Trent.



### And finally

To end with the words of Jane Turner, PSQM Director, in her conclusion to the 2020 Evaluator's report.

'As Director of the Primary Science Quality Mark programme, I was delighted that PSQM was invited to play an instrumental role in the Science across the City (SATC) project. I have had the privilege of receiving regular, lively updates on progress from project leaders and of meeting many of the subject leaders taking part in the PSQM programme. I have heard about the increased engagement of the school communities with science teaching and learning, witnessed at first hand the confidence and purpose of the enabled science leaders and am confident that whole schools now feel empowered to continue the developments and connections initiated by SATC. This report's detailed analysis of the impact of SATC and the role of PSQM confirms my confidence. It is an inspirational read. Despite the unprecedented challenges that subject leaders faced as this project neared the end of the first stage, the enthusiasm and commitment they demonstrated was impressive and their enhanced leadership skills and capacity evident. SATC has empowered school communities across Stoke to improve science leadership, teaching and learning, the primary aim of PSQM, and for that the project leaders and PSQM hub leader should be congratulated, alongside the visionary head teachers and outstanding subject leaders.

The success of the SATC project shows clearly that PSQM can support school improvement in science on a city-wide scale and I am proud to share this report widely with all PSQM stakeholders and other interested funders; and look forward to discussing with them both how this model can be extended, and further evaluated.'

Jane Turner, Summer 2020

## What matters to children



### Pupil voice informing science book choices at Abbey Hulton

**At Abbey Hulton Primary School we have created a brand new School Science Council (SSC) to allow children a voice in deciding what books are available in our school. Our year 6 class were asked who would like to be on the SSC. It was incredibly popular; nearly every child wanted to be a member of this community. Everyone explained why they thought they would be a good member of the SSC, and after much discussion they decided that they would all be members of the council!**

**The first job of our SSC was considering books for our own class. We then got together, bringing favourite science books. Our favourites included both fiction and non-fiction books, and we talked about what made them a good book and why we liked them.**

### Our favourite books by the Year 6 SSC

#### The Molliebird – Jules Pottle

- We thought this story clearly explained evolution in a fun and interesting way. It really made us think about what happens and why. We felt very sorry for the bird when the snake kept eating her babies.

#### Life Cycles: Everything from start to finish - DK

- We really like how this book covers everything. Every topic is covered and we could all find something interesting to read and learn about. You can learn about plants, animals and habitats all in one book. We think this book would be very popular in all KS2 classes.

#### Everything Sharks – National Geographic Kids

- This book is amazing if you love sharks! We loved all the pictures and there are so many facts about sharks. It is a book everyone in year 6 loved looking at. Our favourite fact was about the whale shark. Did you know their spots are unique? It's a bit like finding constellations in the night sky.

#### Pig Heart Boy – Mallory Blackman

- This book is different to any book we have read before. There were lots of things we weren't sure about in this book, but we really enjoyed reading it. We felt like we could empathise with the character and it made us think about the heart in more detail. We would like to research more books similar to this for other science topics.

In our next meeting we discussed whether fiction or non-fiction books made a better read. We considered the strengths of each and how they helped us to improve our science understanding. We decided that we liked a mixture of fiction and non-fiction. For example, we loved Pig Heart boy, but we also liked a non-fiction book to help us learn the facts of the circulatory system.

Before the next meeting we were challenged to think about which books we would want in our science library. In the final meeting of the year we were very excited to finalise some books to buy. We decided to include lots of the books that were recommended in our previous meetings, and we also had a look at some of the books reviewed in the Science Across the City CONNECT Journal (Issue 2). We wanted to make sure we included books that we knew other children would like.

### Some of the books that we had researched and chose included:

#### Hello, is this planet Earth by Tim Peake

- We love the pictures in this book and think that in year 5, when learning about space, this will be the perfect book to help visualise some of the things. We saw a review of this book in the Science Across the City journal CONNECT.

#### Mammoth Science by David Macaulay

- We loved all the amazing pictures and diagrams in this book. It makes the science easy and we think everyone will want to read it as much as we do. In year 6 this book made reflection easy during our light topic! We thought the mammoths' way of explaining was very clear. We would like to have more copies of this book for everyone to enjoy.

#### The Firework-Makers Daughter by Philip Pullman

- We wanted to add this to our year 6 library to link to the light topic. We wanted some nice stories that linked to what we were learning about.

The next step for this community is to organise the books we have ordered ready for September, and we are very excited about it. We have started to brainstorm ideas about how to make them more accessible for everyone, as we think they will be very popular. So far we have come up with the ideas of a sharing library, or even a playground suitcase.

**Gemma Coward and the School Science Council at Abbey Hulton Primary**

# The children of Stoke-on-Trent are Thinking, Doing and Talking Science!

Karen Carney and Grace Marson



Through Science across the City, many schools in Stoke-on-Trent are now familiar with the Thinking, Doing, Talking Science (TDTS) approach to teaching science and focus on the development of cognitively challenging practical and interactive primary science lessons. The TDTS strategy promotes hands on, creative lessons with dedicated discussion times, opportunities for creative investigations and problem solving and clear focused recording. So far 62% of schools in Stoke on Trent have benefitted from practical and enjoyable TDTS training from leading trainers Bridget Holligan and Helen Wilson. Through the training they have learned about strategies and activity ideas that can be translated into classroom practice without the need for extra expense and excessive planning.

TDTS promotes a dedicated discussion slot or 'Bright Ideas Time' in all science lessons. Through activities like 'Odd One Out' and 'Zoom In, Zoom Out'. Teachers are reporting that children's confidence has grown, they are more willing to share their ideas and children are confidently using scientific vocabulary.

**Before TDTS**

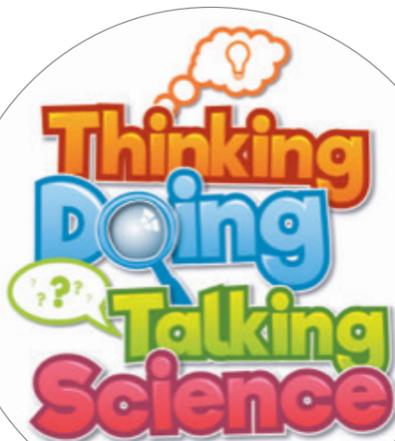
It is hard to answer questions in class because it can be embarrassing if you don't know the answer.

David in Y5

**After TDTS**

I like the 'Odd One Out' questions and the 'Zoom in Zoom out' because we get the chance to discuss our ideas first. I don't worry if the teachers asks me because you can't be wrong,

David now in Y6



Teachers can now assess children's prior understanding and adapt their lessons to suit. Non-science specialists no longer dread the thought of a fair test but look forward to practical lessons focusing on the five different enquiry types.

Creative investigations are helping children to remember what they learn and to develop and apply their working scientifically skills.

Teachers feel that they can teach knowledge and skills in a focused lesson. Recording is sharp, and focused on the learning objective, allowing time to concentrate on the practical hands-on learning.

Since using the TDTS approach, I have found, due to the desire to plan and deliver more creative science lessons, I have really enjoyed teaching science this year. I can honestly say that I have never taught science so well and never felt confident saying that I have provided exciting and engaging opportunities for the children in all of the science topics covered so far.

Y6 teacher

And teachers are already starting to see the impact!

**Dan Jones Y6 Teacher – Sandford Hill Primary School, Stoke-on-Trent**

**Have you expanded your repertoire of approaches?**

Whilst the TDTS workshops provided numerous valuable classroom activities, it is my own pedagogical understanding that I feel has been most improved. Specifically, the inclusion of a Bright Ideas Time (BIT) in every lesson and an emphasis on higher order thinking skills has transformed the atmosphere of science lessons. Previously children only applied their scientific understanding and skills in science lessons, but they are now evident in day-to-day activities and conversations.

**Do the children think and talk more?**

Now the children are familiar with the format of science lessons and particularly the BIT, the quality of science discussions has improved significantly. Initially some children dominated discussions and others lacked the confidence to contribute, however the benefit of BIT is that children contribute at their own level of understanding, meaning that I can adapt my responses to meet their individual needs.

**Has attainment improved?**

Not only has attainment improved but enjoyment and engagement in lessons are far more visible.

**Is there more hands-on learning?**

The learning potential of these hands-on activities is maximised through more effective questioning, opportunities for discussion and higher order skills such as evaluating and problem-solving.

**What the pupils said**

"I like the different ways that we learn like starting with the odd one out and having time to talk about different ideas. I think that listening to everyone's ideas means that we come up with a good answer."

"I like the different experiments and investigations when we work in groups."

"I liked being able to write down everything I know about what we're learning about."

"I can find it hard to write down why something in science is happening but it has been good to talk about this."

**Teresa Barrett Y2 Teacher – Kingsland C of E Academy**

**Which of the TDTS strategies have you implemented?**

I have discovered that Odd One Out activities are a great way to start a science lesson. I had previously used Explorify but, since attending TDTS, I feel much more confident in using this type of activity in a more purposeful way and have even started to create my own Odd One Out ideas.

**What has been the impact on yourself?**

TDTS has demonstrated the value of giving children open ended questions and increased my confidence to just go with the children's thinking. My lessons are much more child-led now; there is less teacher talk and more opportunities for pupils to share their ideas and understanding. The TDTS training has shown me that it's fine to hand over some of the control to the children and I've also been inspired to plan more practical work because simple practical lessons can be highly effective.

I had a light bulb moment when I realised that my pupils lack of responses or well-developed reasoning was not a reflection of their ability, but due to the lack of

opportunities provided. Since taking part in TDTS, I have made a conscious effort to plan more dialogic activities enabling pupils to develop their reasoning, scientific thinking and curiosity.

**What is the impact on the pupils?**

I have certainly seen an increase in the pupils' confidence – they are more willing to have a go as the activities have many correct answers. We now have more partner and group discussions into my lessons and it has enabled pupils to work more collaboratively and to share ideas. The children used to give one word answers to questions in science but now they are able to expand on their answers and explain their thoughts. I also feel that the pupils are more inquisitive as a result.

**Helen Wilson, Associate Lecturer: Science Education from Oxford Brookes University who facilitated the programme in Stoke-on-Trent concludes:**

Working with the schools in Stoke-on-Trent delivering our Thinking, Doing, Talking Science (TDTS) continuing professional development (CPD) programme has been a privilege. There is real vision, passion and drive from the Science Across the City team and TDTS was adopted because of its secure evidence base as an EEF project. The Stoke team was determined not to settle for a 'one off' CPD initiative, but to thoroughly embed the benefits of the training within each participating school through the development of a learning community.

An important aspect of this has been the appointment of 'Champions', practising teachers who had undertaken the TDTS training, to support the participating teachers - a system unique to Stoke. We have met the Champions on several occasions, and they are impressive, being full of enthusiasm and professional wisdom. The TDTS ethos and strategies are embedded within their own practice, and this has made such a difference to their pupils. They are dedicated to their work as Champions. Their presence on each of the four days of CPD undoubtedly added depth and rigour to the discussion groups, and their encouragement of the target schools between sessions added real value to the training.

The atmosphere on each CPD day was so positive and the teachers engaged throughout, undertaking the gap tasks between each day of the programme. These required them to incorporate TDTS strategies within their lessons and reflect on the outcomes. Determined not to lose momentum because of the pandemic we negotiated the development of a mixed delivery of virtual and face-to-face training. Stoke is an area of deprivation and need, but we are in no doubt that teachers and pupils across the city are served exceptionally well by Tina Whittaker and the Science Across the City team.

# Inspiring teachers to nominate aspiring scientists

Scott Walker



## What is School Physicist of the Year?

The School Physicist of the Year (SPOTY) awards is an annual event, now in its sixth year (at Keele University) and supported by The Ogden Trust and Science Across the City. It is designed to celebrate the outstanding talent, success, effort, and achievements of science (physics) students currently in Year 6 or Year 10 at local schools.

## Why it exists?

It is well documented that the number of young people studying A-Level physics has been stagnant for several decades. This has contributed in part to the so-called STEM skills shortage, as low numbers of A-Level physics students lead on to low numbers of physics undergraduate students, ultimately meaning tens of thousands of crucial STEM jobs remain unfulfilled.

SPOTY was designed as part of a Keele University outreach programme focussed on raising and maintaining the award winners' science capital (the sum of all the science-related knowledge, attitudes, experiences and resources that an individual builds up through their life). It is intended that SPOTY students will not only continue to enjoy the subject, but moreover, begin identifying as scientists/physicists who are therefore more likely to pursue further study and ultimately a STEM career. The Aspires Research<sup>1</sup> found, 'A student is least likely to express science aspirations if they are female, White, have low/very low levels of cultural capital, are in the bottom set and do not have any family members who use science in their jobs.' For girls and those from some minority ethnic backgrounds, the visibility of physics role models that they can relate to (both in the media and in the science national curriculum) is often low. SPOTY not only provides an external "validation" of a student's effort and achievement in the subject, providing a



confidence boost in their abilities, but brings them face to face with real, local role models, such as this year's academic speaker, Dr. Juliana Morbec, a Lecturer in Physics at Keele University.

## An ever-increasing number: the value of collaboration

The very first SPOTY awards at Keele held in 2016 saw just 8 nominations. This grew slowly over the next four years and in 2020, there were 36 SPOTY award winners.



Through collaboration with SAAtC in 2021, there was a significant increase in the number of nominations, up to 54. This highlights the impact SAAtC can have, though its strong standing with local primary schools and teachers.

## A city-wide improvement: better science in schools and the community

In 2018, the average number of words written by a teacher for a SPOTY nomination was ~51. This has risen to ~67 in 2021, despite the ongoing pandemic and "burn out" experienced by many members of the teaching profession. By itself, this might appear insignificant, but the "quality" of the nominations has increased similarly. Gone are the "Jasmine has done really well" type comments, now replaced with robust, personalised nominations. As can be seen in the SPOTY nominations from teachers (These are included in the last section), there is overwhelming reference to the nature of scientific method with many teachers noting question asking, problem solving and authentic curiosity. Scientific behaviours are celebrated, and these traits are associated with the identity of being a scientist, and essential in the study of science at all levels. Of particular interest is the recognition that children engage in science outside the classroom and there is clearly an appetite for reading about, and, engaging in science beyond the formal curriculum.

## Looking to the future

SPOTY has, and should continue, to evolve to meet the needs of the students. To ensure that it remains viable, new (STEM) sponsors will be sought. I would also like to see a greater emphasis on SPOTY as a "transition tool". Although SPOTY is the culmination of a student's effort and achievement over the previous year(s), I don't believe it should end there. For example, all SPOTY winners could be inducted into a network of "like-minded" individuals whom they could access for advice and guidance - a support

mechanism to help enable them to flourish. It would also be great if the Y10 SPOTY winners could become mentors to the Y6 award winners supporting them as they transition into secondary education.

One of the criticisms previously levelled at SPOTY is that the award only goes to one pupil per school, and therefore the impact is limited. I would argue that even if the impact were solely experienced by the award winners, this is significant and worth investing in. Moreover, from the teacher comments, and visits to the schools, where wall displays showcase the SPOTY winner, there is a tangible and meaningful ripple effect that permeates a school. Science is seen as important, awareness of the role of science in society is enhanced, and varied and wonderful careers within STEM are showcased. From a student perspective, it provides something for the younger children to aspire to and work towards. And finally, I mentioned role models earlier, and the oft used phrase "you can't be, what you can't see". Well what better role model can there be, than someone from your school being recognised for their scientific effort and achievement? To close this loop (and excitingly this is now beginning to happen), award winners from 2016 who have gone on to study physics or a related subject at university, are returning to their previous schools to tell the current pupils about their exploits. This not only provides further positive stimulus for the pupils, but an excellent opportunity for the past SPOTY winners to develop their public engagement skills. SPOTY should therefore, remain a key part of the city-wide primary and secondary science landscape for years to come!

## SPOTY Award Winners 2021: Teachers' nominations: What the SPOTYs in Stoke-on-Trent can do and do well.

'Her ability to critique and analyse is outstanding for her age. There is great depth to her thinking; she ponders and questions to develop her understanding. Her fantastic range of vocabulary allows her to justify her opinions coherently on an individual basis or as part of a team.'

'he loves to share his knowledge and most importantly he loves to ask why and what would happen if...'

'E. has always had a fascination with the world around him and how it all works. Indeed, during lockdown, he sent many videos and photographs of additional learning and scientific discovery he was completing, all on his own volition.'

'I have nominated G for her amazing questioning skills in science lessons and always

being able to make connections within her learning.'

'An enthusiastic young scientist who is curious about the world around him. He asks thoughtful and insightful questions which challenge him to think deeper. He is keen to work scientifically to find out answers and pose even more questions.'

'She has an inquisitive mind which draws meaningful conclusions from her results.'

'She proudly shared her home learning where she completed work on electrical circuits using a home kit to deepen her understanding of the lessons she had experienced in school.'

'An inquisitive student who loves to apply previous learning and her wider knowledge of the world to tackle new and exciting learning. Whilst she loves to explore how various concepts in science work, she is logical with her questions and ideas. Her investigation enquiries are always well-considered as she is determined to reach a conclusion that satisfies her musings.'

'An enthusiastic scientist who thinks deeply about investigations and questions posed. She is keen to learn about past, current and future discoveries from around the world. M is also a strong advocate for women in science and is aware that representation is growing but also has a long way to go. She has shared views about equal opportunities with her classmates and speaks maturely about her ambitions.'

'He has great awareness of local and global issues which relate to science. He independently researches scientific concepts that he is particularly interested in and applies this wider reading to his lessons at school.'

'He always amazes us with his interesting facts and the explanations he gives for scientific phenomenon. He is intrigued by anything Space related and enjoys expanding his knowledge and understanding by reading books as well as visiting the NASA website.'

'I would like to nominate Z for his resilience when faced with setbacks. For his 'finkering' during British Science Week, he would not give up until he'd shared his expertise with others, and they had a working robot. It is so wonderful to see his eyes light up with anticipation whenever he hears the word 'science'.'



<sup>1</sup><https://www.kcl.ac.uk/ecs/research/aspires/aspires-final-report-december-2013.pdf> page 11

# Informing Effective School Self Evaluation

As a result...

So what!

How do you know?

How do you know?

What is the point?

Why this?

Why now?

Why this way?

## Recognising Effective School Self Evaluation



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