Science ACROSS THE CITY

CONNECT

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

ISSUE 6: CHANGE OVER TIME

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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**

Issue 7	GEO Gender Equality and opportunity.	Legacy for children from enriched wider experiences.
Issue 8	Navigating the STEM landscape	Building on what we know makes a difference in Stoke-on-Trent schools

Acronyms at a glance

SATC	Science Across the City	**OA**	Opportunity Area
PSQM	Primary Science Quality Mark	**CPD**	Continuous Professional Development
TDTS	Thinking, Doing, Talking, Science	**ASE**	Association of Science Education
TAPS	Teacher Assessment in Primary Science	**CSci Teach**	Chartered Science Teacher
SAT	Statutory Assessment Test		

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

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

Change over time: The Start

The policy document or delivery plan for the Stoke-on-Trent Opportunity Area 2017-2020 is the intent document underpinning the SATC funder's philosophy and emanates positive desirable change for the children and workforce in the city of Stoke-on-Trent.

> "The Opportunity Area programme provides a real opportunity to make a difference to the lives of children and young people"
>
> **Damian Hinds, Secretary of State, 2017**

Change over time: Now

After three years of substantial financial investment, hard work from teachers, Science Influencers, senior leaders and others, as well as enthusiasm and much enjoyment too, it is appropriate to reflect upon the differences that have happened in this time.

Re-reading the delivery plan provides a place in time or a pinch point from which to reflect upon emerging strategy against the current position. Issue six sets out to capture the difference made pre-SATC and current, through the perceptions and perspectives of teachers and educators.

The question explored, is not what was the shift that was intended by the SATC team but rather what was the difference made to experiences and practice?

Change over time: The reflection

Success is not linear and doesn't fit neatly into a table as suggested below. Organisations are complex, and the journey is more of a wobbly line with twists, turns and even the odd knot or two along the way. SATC is successful in bringing about change across the city, but with no hard data from National KS2 science ('a knot') to compare locally and monitor the closing of the gap, the alternative and perhaps more powerful teacher voice captures the difference made to them, their children and their settings.

Towards a shift:

FROM	TO
From science experiences as ad hoc in different schools….	to science as core and quality in all schools!
From continuous professional development (CPD) as going on/ sent on courses	to CPDL (the L being the learning that flows from the CPD).
From children doing busy practical activity	to teachers understanding enquiry as essential curriculum knowledge and therefore the learning being purposeful!
From isolated silos	to active communities of practice!
From low expectations of children and education in Stoke	to high celebration about children and teachers' achievements in Stoke!
From discarded or unused pupil science data	to assessment informed curriculum progression that monitors inclusion for all.

Reflections from the Editor

Clare Warren

My involvement with SATC began in 2020 when I was asked to work on the evaluation of the first phase of the project. (Still available at https://www.scienceacrossthecity.co.uk/evaluators-feedback-2020/). Given the theme of this issue is 'Change over time' I thought it would be fascinating to revisit that initial report and compare the findings then with now. The first report was structured around three themes:

ENGAGE – members of the school community doing something they were not doing before; becoming part of a city-wide vision for change.

ENABLE – school leadership takes ownership of change. School planning choices and initiatives driven by the vision.

EMPOWER – continuation of development and connections initiated by SATC reflecting the confidence to 'go it alone'. School culture embraces the wider STEM landscape.

The summary conclusions from the report are reproduced below. For the reasons described in the final article about the symbiosis between the Primary Science Quality Mark (PSQM) and SATC the data were taken from the 2020 PSQM submissions.

Conclusions (extract from the report)

There is substantial evidence of engagement with the development of science teaching and learning in each school, with each schools' experience of **SATC** unique. The science subject leaders have engaged with the children, their colleagues, parents, senior leaders, governors, other local schools and industry. Their links with organisations offering support for primary science education have provided information about best practice subsequently adopted in the schools. For example, there is evidence of improvements in pupils' science enquiry skills, and teacher questioning, promoting high-quality discussions among pupils.

There is more limited evidence of empowerment and enablement, however the data sources limited the information available, and the extent of enablement and empowerment may be understated.

Taking the themes of Engage, Enable and Empower, where are we now?

ENGAGE. Reading the articles about Michele, Rachel, Julie and Ash, in addition to Sarah Earle's thoughts, the level of engagement remains impressively high. The understanding of Engage included the phrase, **"becoming part of a city-wide vision for change"**. I suggest this should now be replaced by, **"being part of a city-wide vision for change"**, because nearly all schools in Stoke have engaged with SATC. The extent of the engagement of the school communities continues to amaze!

ENABLE. The understanding of Enable includes the phrase **"school leadership takes ownership of change"**. If we ask the woman on the Clapham Omnibus (in these days of gender equality) to tell us about primary school leadership, I expect her to consider only the Head Teacher. However, what the articles make clear is that the current drive for systems leaders is eminently possible given the right environment for them to flourish and implement change. Julie, Rachel, Ash and Michele are all excellent leaders because they make significant differences to the teaching and learning experiences of their own pupils, plus so many others throughout their whole school communities. While the initial evaluation found limited evidence of Enablement, all issues of CONNECT provide evidence that, **"school leadership takes ownership of change"**.

EMPOWER. While the original understanding of Empower includes the phrase 'go it alone', Ash used an equivalent phrase, **"able to stand on their own two feet."** The empowerment of Ash, Michele, Julie, Rachel, Science Influencers, and other science leaders across the city has led to what Sarah Earle describes as a **"hotbed of innovation in primary science"**. **"Continuation and development of connections initiated by SATC"**, jump off the pages at every turn. The four schools represented here, plus so many others, are clearly embracing **"the wider STEM landscape"**.

Moving mountains!

The original evaluation found oodles of Engagement, yet limited evidence of Empowerment and Enablement, possibly because I was not looking in the right places, or perhaps because they took time to develop. However, the impacts of both Empowerment and Enablement are now evident across the city and beyond. For me one phrase in this issue stands out. Julie neatly articulated the magnitude of SATC achievements, stating that, through collaboration, those involved with SATC can, **"move even bigger mountains"**. For the SATC team moving Scafell was never going to be quite enough when they had their sights set on Everest!

"Connected, embedded, sustained."

Michele Condliffe is Science Subject Leader and SENCo at Holden Lane Primary in Sneyd Green, Stoke-on-Trent. Back in 2019 Michele led her whole school community as they worked towards, and were successful in gaining, a Primary Science Quality Mark. Three years on, I visited Michele to ask how Science Across the City had supported her to, not just maintain improvements she has instigated to gain the PSQM, but to encourage and help her develop science teaching and learning further still.

Michele Condliffe is Science Subject Leader and SENCo at Holden Lane Primary.

We looked at the slides she submitted to PSQM as evidence of improvement across the school and she described the improvements she instigated, and the ways in which science is now better still. Her first slide showed the Holden Lane's Principles of science teaching and learning. **"As part of the PSQM we were required to develop Principles of Science Teaching and Learning, and we asked both teachers and pupils what these should be."** Michele spoke about each of the Principles in turn.

Principle 1 – All children are engaged and taking part

Mainly we wanted children to be actively taking part in science lessons and the Principles helped us to do that. Before then the children would play more of a passive watching role but during and since PSQM that has developed with children investigating their own science questions (also Principle 4), and each year they now participate in the Great Science Share[1]. These changes have been supported by the SATC Coaches collaborating with our own teaching staff.

It isn't just lessons the children are taking part in. We are now giving them more say in the curriculum and how we teach it. Previously I didn't have any meetings with the children to find out their opinions, but now we have appointed children from each class as Science Ambassadors and we meet every term; in fact, we met today. The ideas that they come up with about ways to improve science are just fantastic. Before we didn't really give them a say, but now we do.

[1]https://www.greatscienceshare.org/

> Before it was just me directing things but now staff, pupils, parents and governors have a voice.

However, it isn't just children who are getting a greater say. When the governors and the parents come into school we ask for comments, just to see what they think about science learning and what we could improve for the next year. Children make their views known; we have questionnaires; we have the Science Ambassadors now. When we have staff meetings, we also ask staff their opinions about how we can improve. Before it was just me directing things but now staff, pupils, parents and governors have a voice.

Principle 2 – Investigations are included in lessons as much as possible, and all children have a hands-on approach

We are so proud that children are now hands-on, always thinking up their own ideas and suggesting what we could do. Before staff were just teaching in their own style and were not aware of the different science enquiry types. They are becoming more aware of them now, but I think we still need to go a little bit further, and make sure they're all used in each year group. It's a coincidence that I was talking about science enquiry types with the Science Ambassadors today and just going over them because they weren't aware of all of them, especially pattern seeking and observing over time. That tells me where I need to focus.

We are so proud that children are now hands-on, always thinking up their own ideas and suggesting what we could do.

Principle 3 – New vocabulary is introduced and discussed. This is then displayed for the children to use throughout the science topic.

Before PSQM there were no displays of vocabulary and children weren't clear on what they needed to include. Now, across all the year groups, the children can use the vocabulary and explain the science. We have also introduced an organiser for each topic that is stuck in their books and it has all the vocabulary they will need for that topic. They use the vocabulary in both their talk and their writing.

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Principle 4 - Children are allowed to think of their own questions that they could possibly answer

We have really given over ownership of science to the pupils, and they are getting so good at asking scientific questions and suggesting ways they could answer them. This then links back to Principle 1, because it makes them so much more engaged.

They are getting so good at asking scientific questions.

Principle 5 - Children are supported with writing by having access to vocabulary

Once we began working on Principle 3 this all fell into place. Now they've got the vocabulary, so they can naturally use it in their writing.

Principle 6 - Children are grouped by scientific ability to allow for differentiation

In terms of differentiation, we now try and group children by ability. Before there was less focus on how am I going to extend the thinking of the higher ability pupils and support the lower ones. But now we ensure the differentiation is there, so we meet the needs of all pupils.

Principle 7 - Equipment is sourced in advance of the lesson to ensure that it is available

Equipment was a bit of an issue. The staff did not always have it ready and prepared, probably because the science cupboard wasn't organised, and we had limited equipment due to lack of funding. Now we've got so much equipment because it's been funded by SATC. It's labelled by topic so staff can go and get the right box, bring it out and everything is so much easier for them. The children can go off and find out for themselves. Lessons where they just watched the teacher have completely gone.

For example, our data loggers are now being used and we've even got some training for key stage 2 staff to be able to better understand what the data loggers can do, and think about when and why they might use them.

Lessons where they just watched the teacher have completely gone.

Principle 8 - Visitors and trips are used to boost learning experiences

We had very few visitors or trips but thanks to the SATC funding we have recently been to see Jina and the STEM Sisters at the Mitchell Theatre and the children experienced the meet a scientist STEM Sisters workshops in school. Now that Covid restrictions are lifting we are regularly seeing more STEM visitors in school.

As well as visits and visitors, to enrich the curriculum we also organise Science Weeks and Science Clubs. Our Space Week is an annual event, and the parents get to see what's going on in science. Then we've got the website which is regularly updated with lots of science information. We didn't have that before.

Some of our visitors are SATC Coaches and they are here to support our teachers. Before PSQM I was

[2] http://www.hmdt.org.uk/hmdtmusic/stemsisters/home/

"Connected, embedded, sustained"

quite isolated as science subject leader but, thanks to PSQM, I began to make those links. However, SATC has taken that to a whole new level. I no longer feel like I'm on my own, because I have so many links to all the wonderful things that are going on. Sometimes I don't know which to do next! The opportunities are so wide ranging, and all are valuable.

> I have so many links to all the wonderful things that are going on.

So, if you were to rewrite your Principles now, how do you think they would look different?

I think we might include links between science and learning in other subjects. We are still trying to develop that a little bit more, but we have already made links with reading comprehension and with maths. We tend to do our best cross-curricular work when we do our science and space week, then we're able to link things really well together.

Originally we didn't include anything about links with families but these continue to improve. Parents weren't aware of what we were doing in science. We did have a newsletter that went out with the curriculum overview but now there's a whole load of information for science on the website.

With science capital we've come a huge way; before we hadn't got links for the science for the children. When we had our recent review that came out as one of the strong areas; children's aspirations have been raised and they're aware of different jobs we hadn't even talked about in school, so they've obviously done their own research.

At the start of PSQM presumably these became your principles because they were aspirational. How would you describe them now?

I just think this is more of a checklist now and we have been fine tuning little things, such as the working scientifically, and getting the assessment right for that.

Some schools regard PSQM as a destination but your clearly see it as the start of a journey.

Absolutely, everything I did for PSQM, all of the logs, the visits, the CPD, the pupil and staff voice, I've just carried them on. My science leader file is a good clear, organised way of making sure nothing is forgotten. Other staff have taken on the same format for their subject leader files, so it's developing those too. The activities we carried out for the first time with PSQM are now embedded in our school calendar.

Please tell me about some of the Professional Development opportunities offered by SATC.

Yes. All of the improvements I have described don't happen without a substantial investment in CPD. It is thanks to all the training opportunities that SATC has provided that science has improved so much and continues to do so. Before the PSQM I didn't have any links to anybody. I had no idea how to develop myself, but both PSQM and SATC have pointed me in the right direction.

> Science has improved so much and continues to do so.

The Thinking Doing Talking Science training[3], for example, made me focus on drawing out the vocabulary more and getting children to talk about science. I can see the value in offering a variety of different ways to record their work rather than just writing. I've just had some training from Ash Jones, a SATC Science Influencer, on the Teacher Assessment in Primary Science (TAPS) resources[4], so we now have a focus on assessing working scientifically. Before we weren't quite sure how to assess it, but now we know how the TAPS resources can support us with that. Therefore, we know what the children struggle with and what we need to support them.

Science specific CPD for teaching science was a bit of a neglected area. There were no opportunities for external CPD, but now we've got the links to the Science Coaches and all the other opportunities available through SATC, we can really develop our teachers' skills and knowledge. The Coaches offer

[3]https://tdts.org.uk/
[4]https://pstt.org.uk/resources/curriculum-materials/assessment

support to both myself and my colleagues and they will come in to talk to children if I ask them to. Now I know of so many websites with great resources, like Reach Out CPD and the Association of Science Education (ASE).

We are currently working with a Science Coach, Becki Price, on retention of knowledge and we can see the value of that, so when we review our Principles that will go in somewhere to ensure children are retaining their learning.

The Science Coaches also support us with Science Reviews. The last one was really informative. It is great to see science teaching and learning through a fresh pair of eyes. It validated what I already thought were our strengths and areas for development. It was a good match. Our action plan is now even stronger thanks to that SATC review. The review enabled me to put some extra details in and fine tune it because I tended to be very broad with my actions, and they said, I think you need to narrow it down and have a focus, so it is now more focused.

Lesson observations are included in SATC science reviews. There were some previously but monitoring wasn't rigorous and assessments were a bit ad hoc. Now we learn about what our pupils can do based on their work, supported by information from tests. Staff are aware of where the children are in their learning and what they need to do next.

Staff are aware of where the children are in their learning and what they need to do next.

Your pupil voice, shows how much you've come on.

The final PSQM slide showed the change in pupil voice between the start and finish in 2019, but if you asked the same questions now I think you would see a long list of when they carried out their own investigations. In answer to what is science? I would expect them to say more about scientists. I think some might refer to vocabulary.

Please can you highlight the three major differences since you completed PSQM

I think one is pupil involvement; sharing their views. They can tell you so much. Their ownership of investigations as well as the pupil voice questionnaire and Science Ambassadors. They can tell you what's happening in the classroom; they can tell you how to improve things; and they can help you to do that across the school.

Two is the links to other people that have now opened up. Through SATC we have so many people who are able and willing to help. There are also so many opportunities to enhance the curriculum with visits and visitors.

Third is probably our parents. They are a wonderful resource. They are really supporting and engaging the children with science at home and if they do science at home it's going to improve in school.

So What?

Science has become so much more enjoyable to teach. I am thrilled by the number of staff who now tell me about their science lesson or ask questions so I can support them further. Before it was, 'I'm not talking about science; I don't really know what I'm doing', but now they'll talk to me and ask for ideas and information which is really good.

I am thrilled by the number of staff who now tell me about their science lesson or ask questions so I can support them further.

"Knowledgeable, reflective connected."

Back in 2019 Rachel led Ash Green Primary's whole school community in developing science teaching and learning. The results were sufficiently impressive to gain the school a Primary Science Quality Mark (PSQM). Three years after gaining the award Rachel is now working towards reaccrediting. We met to discuss how science teaching and learning improved during the initial PSQM year, and the ways in which Science Across the City is enabling her to demonstrate further improvements as she collates her evidence for her 2022 PSQM submission.

Rachel Griffiths, Science and Computing Leader at Ash Green Primary Academy

Once you completed your previous PSQM how did science teaching and learning look

We achieved so much in that year. Pleasingly, we decided on some clear values that staff and pupils had been involved in creating, and we all shared the same vision for science. A pupil council for science, the Science Squad, was established and they were helping me; telling me what was going on in school; coming up with ideas; and monitoring. So that was terrific. One of the things we worked hard on was embedding the Bright Ideas Time[1] which came out of the Thinking Doing Talking Science[2] (TDTS) project. We introduced it in staff meetings and then there was an expectation that staff incorporated the strategies in their weekly science lessons.

During that year we did quite a lot of staff CPD, so the enquiry types were familiar to staff. One of our slides showed that at the start only 3% of staff could name the five enquiry types but at the end of PSQM that was up to 82%. Moving away from worksheets, we started using floor books, which was important in supporting the shift towards more practical work. Science clubs became a regular feature that we have continued since as far as possible, and our next step was to involve parents a bit more. In summary, we finished the PSQM year with the profile of science so much higher than when we started.

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What was your initial involvement in Science Across the City?

Before SATC started I attended the original TDTS training at the National STEM Centre in York. It was brand new and we'd not tried anything like that but it has worked well and we still are doing this in school. Because I had already implemented it in my school, when it was decided to bring TDTS to Stoke I was invited to become a Science Influencer and help other schools across Stoke and in our Multi-Academy Trust embed the practice in their schools. This enabled me not only to explain how Bright Ideas Time was working in a real local school but also, to pick up ideas from other schools too. We discussed what might this look like in their school, and that was fascinating because I could better understand every school is unique. We considered how you can disseminate the strategies across the school so colleagues learn but without them having been on the training.

> I could better understand every school is unique.

[1]https://pstt.org.uk/resources/curriculum-materials/bright-ideas
[2]https://tdts.org.uk/

Being on the course and seeing other people's faces light up as they got it was a delight. I had that same experience a few years ago in York and it was nice to share the vision of making science practical; making it higher profile. It was great to think I'm still following those values and I've not gone off at a tangent – I'm still on course with my initial understanding. Revisiting it with a different perspective but knowing it works in our school.

It was interesting meeting informally with Helen and Bridget, the TDTS facilitators, outside of the training course and speaking to them. They were curious to find out about the way the Bright Ideas Time was working in my school a couple of years later. Talking to them prompted me to reflect on the Bright Ideas Time; how it fits my ethos as a science leader and how it fits into the school's ethos.

Being asked to be involved gave me a boost. It gave me confidence as subject leader.

It is quite a compliment saying we've seen this practice in your school and we would like you to share it with others, and being asked to be involved gave me a boost. It gave me confidence as a subject leader to think that someone believes that I know what I'm talking about. The focus on reflection was really beneficial too, as through my role as a teacher educator in school I have been thinking about that reflective practice quite a lot.

Being involved with SATC was inspirational and I enjoyed my role as a Science Influencer. However, I also have responsibilities in school and I wanted to do some SLE work so I had to try to find a balance between taking on extra things for SATC and the work in school. I wanted to do the best for my class and I was simply wearing too many hats so I decided to take a step back. But the great thing with SATC is that there are so many superb opportunities and you can dip in and out to suit the other pressures in your life. I know there are others who started as Science Influencers who are now doing deep dives in other schools and running PSQM hubs for example, but it wasn't the right time for me to take on a bigger role in SATC.

How do you choose which bits to dip into and which you might come back to at some point in the future?

I was talking to some of the new science leaders in the City and they were asking what should I go to first because there is so much choice. When I was first involved in SATC it was so exciting to have all these great opportunities so I threw myself into it but with hindsight a more gradual approach is probably better. It is best to focus on your school development plan, so if assessment is a priority in your school, then you go for Teacher Assessment in Primary Science (TAPS). I've been involved in TAPS this time round because assessment was an important next step for us. Whereas for those schools where practical science is not embedded then TDTS is probably the best place to go. The choice available can be somewhat overwhelming if you are new to leading science. I advise them to think about what they need and not sign up for everything because then you end up with too much to do.

It is great that there is a selection and I think the PSQM audits at the start are really helpful in enabling you to focus and decide on your school's priorities and next steps. Where are the gaps I need to focus on first?

What was your highlight between completing PSQM and now?

Doing the Chartered Science Teacher (CSci Teach) and the way it linked to all the work I was doing anyway, so why not get the accreditation for it? When talking to the governors or meeting with people from other schools I think it's that stamp showing this person does know what they are talking about. It is helpful for the Head to know that an expert external organisation approves of what I am doing and that I am on the right track. We are seeing good progress in science and working towards good things here and it is wonderful to have that acknowledged. It is also great to reflect on where you were, where you are now and where you are going next.

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"Knowledgeable, reflective connected."

How would you describe science teaching and learning at Ash Green now?

We are now working towards reaccrediting our Primary Science Quality Mark and trying to re-establish the links we had before Covid. We are beginning to go back to work with Trentham High which used to be a regular thing, and trips and events including parents are starting up again. Being in the primary science network, it's nice to talk to other science leaders and share ideas of other things we could do. However, thinking about staff well-being and workload is important and whenever I'm planning to introduce something new it's good to reflect on whether now is the right time or will we end up with the staff on their knees?

Now that we are getting back to normality we've been revisiting and re-establishing Bright Ideas time with new staff. We have revisited our values and when we've done pupil voice recently pupils are talking about experimenting, trying new things, solving problems, asking questions, whereas before they talked about science being explosions and making slime. So, it's really good to see that shift in pupil voice has been maintained and even improved upon.

During lockdown I had more time to think than I normally would. I was focussing on how to improve consistency across the school. How to make sure the values I have as a science leader are filtering down to each classroom. The time was used to produce a whole school plan with all ideas from the SATC CPD embedded in it. Bright Ideas Time, practical enquiry types and references to other resources are mapped out lesson by lesson for each year group. I have developed it since then and staff feedback has been really positive. Having seen the books, children are exposed to all the enquiry types. Obviously, we haven't done a full year but that has been a really brilliant step forward. I don't want to be too over prescriptive, and I am not telling teachers what they can't do because they're very good. What I am saying is teaching is incredibly complicated so how can I make this as easy as possible. Bearing in mind the current focus on progression of skills, it's one way to make sure we're not repeating what has been learned in previous years. I have been using that with my year group as well. It has really worked with coverage and when I'm monitoring I tick off which lessons they have done so I can be sure the coverage is complete.

I have shared bits of it with other Science Influencers. I've shared it with my sister who is a year 5 teacher in Cheshire. It's all content I have nabbed from other places. So far I think it has been successful in our school. Lockdown presented that opportunity, and the document highlights what I have learnt on all these great courses. Hopefully it filters down so it makes a difference to the learning of a year 3 child for example.

After lockdown we went back to individual books because with floor books it was hard to monitor consistency between different year groups. I considered providing CPD on big books or whether practical work and working scientifically are now well enough embedded that we can go back to individual books and I decided it was. Hence, we've gone back to individual books. At the time floor books were right for us, but now going back to individual books is the right decision.

The connections with other science leaders that you have made because of SATC are clearly important to you.

I remember Amanda had mapped out key enquiries for different topics that she shared with me, and if I needed to know something about science clubs I'd go to Becki Price. Having the WhatsApp group is such a useful source of information. I was involved fairly early on, so I know who to talk to to find out about different aspects of primary science and it's always good when you go on a course and you know someone there. It isn't just locally that we make connections. Stoke looks outwards. We are using experts from elsewhere and when it involves the likes of Sarah Earle, Helen Wilson and Bridget Holligan who do work outside of Stoke, it makes the training all the more valuable. All those connections make it all stronger.

I know who to talk to to find out about different aspects of primary science.

Without SATC I would have been starting from scratch.

All those connections make it all stronger.

I was also involved with the Science Across the City recovery plans, the CALM plans. Without SATC I would have been starting from scratch. That's the great thing about SATC is you're not working alone. We collaborate and the outcome is better because of that collaboration. The FELL document is another great example.

Is your approach different now compared to the previous time you completed PSQM?

Yes. Time and teaching resources are precious and I think I see that more clearly now. I think when I was new to subject leadership I saw all this new stuff and I thought let's do this and this. PSQM was fabulous because it ensured we had the basics in place. I think it Is helpful to think about the options available and consider what is actually going to embed. We could do lots of great staff meetings but we need it to be making a difference a few months down the line. I think my action planning is now more realistic because I have a much better idea how long things will take. I think I'm more experienced being a leader, working with colleagues who perhaps aren't as confident. The way I approach colleagues who are perhaps older and more experienced than me is improving. That comes with experience and knowing how people might react to things. The first time I started PSQM I was in my second year of teaching and I was dead excited and I went to York and started all these things but now I am a lot more measured and considered about actions. Although I do less I do it so much better and I believe it has more impact.

Currently this big focus on curriculum has everyone vying for time. When I started PSQM I was the only subject leader demanding everyone's time and attention but now we are all like that. It is a great position for the school but there is so much going on. How do you keep the same high profile for science without having a negative impact on other subjects? You need to be aware of the needs of other subject leaders and have a whole school or team approach. We must be realistic about what myself and others can achieve.

How will your PSQM portfolio look different this time compared to last time?

Last time we were focused on doing working scientifically but now we will be looking at progression in working scientifically skills. There will be evidence of progression across the year groups and I think there will be more focus on pupil voice, experiments, enquiry types, vocabulary and retrieval which are whole school foci.

We have been part of the Better Reading: Better Science (BR:BS) group so I think there will be a slide about reading and science; cross-curricular reading lessons that are science based so we learn some science in our reading time and were not taking away from the science. During our Science Book Day and we all looked at Ada Twist Scientist and discussed what makes a great scientist. Sometimes those links to scientists get missed out of our regular science lessons. Grandparents were involved as well, so that was wonderful. Some of the children wrote me some lovely little notes saying I never thought I could be a scientist but now I think I could be a scientist. That was delightful. I've also invested in some science themed books to pre-teach science concepts. I've mapped these across the year groups so that's the next thing to be launched when I find time to get the books in the right places.

Children wrote me some lovely little notes saying I never thought I could be a scientist but now I think I could be a scientist.

Now we are covering the curriculum more fully we can take an in depth look at assessment, making it more rigorous and valid by carrying out moderation. A colleague was asking about TAPS and why didn't I do it sooner, but actually back then we weren't doing enough science to assess it.

So how do you see PSQM and SATC working in synergy?

As you go through the PSQM success criteria and discuss it in your hub you identify your key needs, even if it's just over coffee. What matters is that you are having those conversations about what worked well, what worked less well and when is the right time to do it. So those relationships created as part of SATC enable you to meet with others and talk to them. Communication channels are opened up, even more so when you do it in person, and it's sometimes in those incidental chats that cause the most significant things to happen. I'm so pleased we are back meeting in person again. Thanks to those synergies it's been amazing watching SATC grow and there are so many schools involved now. The subject leader from the school I supported with TDTS is now on that TAPS training that I'm on, so it's nice seeing her journey and catching up with what she's been doing with science since then.

I have really enjoyed this opportunity to go back and reflect on our previous PSQM submission and see where we were, think about how that relates to where we are now and consider what the future might hold.

"Better together."

Julie Clarke, one of two Science Subject Leaders at Priory CE Primary School, reflects on the progress in science teaching and learning that is apparent when she compares the evidence she submitted to gain a Primary Science Quality Mark in round 16 (completed in 2019) and the current position.

Julie Clarke, Science Subject Leaders at Priory CE Primary School

So, what's the difference and how did you get here

At the end of PSQM round 16 we were in a good place. Science teaching and learning had moved a long way in our school, but what I have realised with hindsight is that we were quite isolated. Science Across the City (SATC) was only just up and running at that point, so for me that's the big hole when I look back, it was just us doing a good job on our own. I think the difference that SATC has made is vast. We weren't doing enough in the City; we weren't doing enough with other schools. Since then we've had so many opportunities. There has been so much training, we've listened to Jasper Green (Chief Ofsted Inspector for Science) and he even answered one of my questions.

> We've had so many opportunities.

The whole focus has changed radically from insular, to citywide to nationwide. Take for example, the Ten Key Issues with children's learning in primary science in England[1]. I think we can relate to some, if not all, of those. But Science Across the City has created a team of people to enable us to act on that information. As soon as there is a problem we'll see if we can work together. We also work with lots of other support networks like the Royal Society of Chemistry that recently offered training on enrichment. Doctor Jenny Watson presented her Everyday Science Cards that are an invaluable resource. Nikki Waller has facilitated sessions on planning. The CPD opportunities have been amazing.

Assessment is one particular area that is stronger now. Through our involvement with BEST at York University we've moved away, thank goodness, from testing the children constantly for science. We use their fantastic resources in different ways. In upper key stage two we still use them as an end of year quiz and this year we're hoping to see evidence of measurable progress between year 5 and year 6. We also use the slides for end of unit quizzes and going back to revisit topics. We might throw one of those in as a starter or in the middle of a lesson just to keep it fresh in the children's minds. They help with our focus on retaining knowledge.

One thing I think is true of our children, is they wouldn't always know what the lesson's learning objective is. They may have it written in their books and gone on to do a lovely investigation, but I think now we need to have a stronger focus on national curriculum learning objectives. Science lessons should become more purposeful and link to real life. We must guard against 'fun' lessons. No one saying you can't enjoy lessons, but they have to be purposeful, and they have to link to the national curriculum, otherwise what's the point? Science clubs offer an opportunity to do more of what the children want, but you can always link everything back to real life and the national curriculum.

SATC has opened up such fantastic opportunities for working together. Stoke is an area of deprivation and the funding has made such a huge difference. It has changed our mindsets, so now when we consider resources we sit and plan and think about what we need to move the science forward in our school. Budgets are limited and we have got much better at only buying things that are purposeful and necessary rather than some of the wow resources used in a single lesson, then the money's gone. We've developed links with the local high school so we can borrow, or we can go up and they will teach or demonstrate and students can have those wow lessons. That's another example of how we work together. By working in isolation, you are giving the children a limited experience. You really need a network of schools working together.

Do you think building relationships with other teachers is an important part of that?

You learn that very early in your PSQM journey, it must be a collaboration between children, staff, families and governors if you want to move forward together. If there's no ownership,

[1] https://seerih-innovations.org/just-good-stuff/10-key-issues/

nothing is going to change; it's just you trying to move mountains and that's never going to happen. But now it feels like that collaboration includes the other Science Influencers and we can move even bigger mountains. Before, across our school, we shared a common vision, but now we're part of something a lot bigger. Now we have links with all the primary science organisations out there and other schools with different catchment areas. Without SATC we wouldn't have used or had access to these resources like we do now.

What is it about SATC that means that the engagement with these other organisations is more effective?

> The Science Influencers work together in the interests of what's best for the children.

Sometimes I think that there's too much information out there, so this time I think we've worked on quality of resources not quantity. We decided to make a quality resource document a bit like the FELL document. We know we can go to that document and that somebody else has looked at and recommends the resource. It's been quality assured. The Science Influencers work together in the interests of what's best for the children. We have similar problems because teaching in Stoke is teaching in Stoke, but we are unified and we all have common goals. If you have an issue you can ask for help and somebody will know the answer immediately, or will know somebody that might, or will find out. Having that team of people around us this time has been massive. Although we have slimmed down what we have tried to do in terms of CPD, we've looked more at quality rather than quantity.

You have made it clear that relationships and working together is important, but please tell me about how the people in your school community work together.

When we did PSM before it was me doing it alone, but now Rob and I work together. Rob has attended the PSQM training and come in with a fresh pair of eyes. PSQM is a perfect introduction for him becoming science leader and it's good for him to come in and change things. I also think it's helped having two science leaders in our school. Rob and I are very similar; we have a common vision. We collaborate and work together. The Assistant Head we both report to will regularly come into Science Club and sit and spend some time with the children who wouldn't you ordinarily get so much time with adults in school, which is priceless.

Doing PSQM again has spurred us on to change the principles. Rob wanted to change the principles documents and now he has revamped it for the better. We agree we haven't got time for having fun for the sake of it, so it's got to go from our principles. Going back to the ten key issues document, we have learned from that. That's another step forward. It is OK to have fun during science lessons as long as the learning is clear.

Our principles now direct us to focus more on learning, curiosity and child-led investigations.

> Our principles now direct us to focus more on learning, curiosity and child-led investigations.

Priory Church Academy

Core Principles of Good Science Teaching at our school

- Promote curiosity: children talk, ask questions and try to find out the answers.
- Differentiation and challenge.
- Links are made to real life situations, visits, visitors, STEM (Science, Technology, Engineering, Maths)
- Children have the opportunity to plan, explore and investigate. (Indoors and outdoors.)
- Children are progressing having fun, something 'WOW' happens
- Things go wrong and children are allowed and encouraged to make mistakes.
- Good quality resources and IT are used.
- Quality displays to promote and celebrate learning.
- It is taught in a cross-curricular way.

Figure 1 - Previous Principles of science teaching and learning

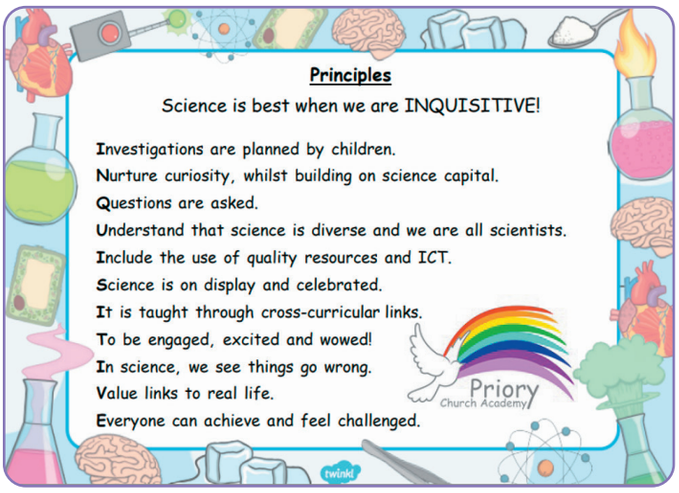


Figure 2 Revised Principles of science teaching and learning

"Better together"

Rob has worked hard to highlight the word inquisitive and to make sure all the staff and governors really understand this approach also applies to English and maths. I know we don't like the phrase 'catching up' but we understand children have gaps in learning in both English and maths, and science lessons can help to bridge those gaps. We can apply what we know to maths and English lessons and we have also used odd one out in religious education. Much of the listening, the observation and other pedagogic strategies have helped us all.

Children now have a more powerful voice in their science learning.

Children now have a more powerful voice in their science learning. For example, they have loved Explorify and will frequently ask, 'Can we do odd one out?' 'Can we do zoom in, zoom out?' In the last cycle of PSQM that was just beginning, but now it's more like everyday practice.

Something that has been difficult recently because of Covid restrictions is being able to involve parents. In the earlier PSQM round we tried to establish a network of parents who we can call on to help us. If children can meet them on Zoom it doesn't need to be any longer than 20 minutes, so Rob and I need to pick this up again now and establish which parents are happy meet the children via Zoom and tell them about their work and answer questions. This clearly links to Science Capital and supporting children who have forgotten what they can do; what they can be. We used to have family learning opportunities in every year group, but we haven't got those currently so that's an area we need to work on.

Our staff are fairly stable which makes a huge difference because they remember working towards PSQM previously and the positive difference it can make. They understand, so when we ask for examples of science learning they help. The trust and empowerment are there. The staff have had a big say in the way children learn science.

We also listen to outside voices, considering what an Ofsted deep dive might mean for us. We consider where children are in their science learning and where they need to be. We do understand that children might be misconstruing facts or not able to pick out the important information and use it appropriately in the skills work. Therefore, we've slimmed down some of the activities so we really focus on the learning and making it relevant to children's life experiences.

Any opportunities presented by SATC, we will take them. I think one big difference between this PSQM and last PSQM is if we ask for things this time SATC has given us money so we can get them or there's an opportunity. Whereas last time the answer was, 'well that's not going to be possible'. The funding has made a big difference to the availability of science clubs and other enrichment opportunities for the children. We've engaged wholeheartedly with our Science Clubs and visits.

So What?

Because we are a church school the theme of our previous PSQM final slide was 'Together' (see below), that is a really important word for us as a school. This time Rob is all for putting inquisitive in there, but I keep dropping in that we are predominantly a faith school and the importance of togetherness. There's a lot to be said for science and faith working together and we have a lot of discussions about this in key stage 2. Rob and I are still grappling with whether the theme of the final slide should be together or inquisitive, but collaboratively we are thinking about our children and the best way to engender the skills and knowledge they will need to thrive in the future, not just for a PSQM badge.

To sum it all up, the fundamental difference between PSQM last time and this time is Science Across the City.

"Not just another area."

Sarah Earle, from Bath Spa University, the academic and practitioner behind the Teacher Assessment in Primary Science programme, has been working with teachers from across Stoke-on-Trent and we asked her to share her thoughts on the changes she has noticed over that time.

Sarah Earle from Bath Spa University

It has been a pleasure to work with teachers from Stoke-on-Trent over the past three years. When we started the first Teacher Assessment in Primary Science (TAPS) group in 2019, it was a new geographical location for delivering the recently launched 3-day TAPS course. As a new course, there were reflective discussions around the training, but largely the first iteration was focused on delivery and supporting the teachers with their formative assessment practices.

However, Stoke-on-Trent is not just 'another area', it has become a hotbed for innovation in primary science. Now when I go to Stoke, I know that I will be greeted by teachers who are enthusiastic about developing their practice, many of whom are beginning to share this beyond their own schools. For example, through having completed the Primary Science Quality Mark, the teachers attending TAPS training now are a step ahead of those in other regions. They are aware of initiatives like Explorify and the Great Science Share, which means that TAPS sessions can focus on formative assessment rather than explaining from scratch.

TAPS

The role of the TAPS Champion is unique to Stoke and has also evolved over time. The Champions have developed in terms of both their regional support for schools, and their own knowledge and confidence in leading professional learning. The new moderation development work that we are doing this year is only possible because of the strong and sustained leadership support across the city – this work would take twice as long elsewhere.

The table show just how many teachers across Stoke-on-Trent have engaged with TAPS over the past three years, and continue to do so.

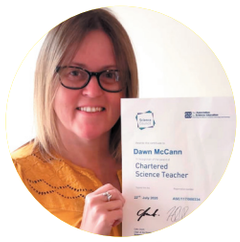
TAPS in Stoke-on-Trent Facilitated by Sarah Earle	Teachers Engaged
Cohort 1 All sessions face to face 2019/20	11
Cohort 2 Day 1 face to face then adapted to online 2020/21	40
Cohort 3 2022- Additional offer responsive to school request	12
Moderation Resource Development and Innovation	10
TAPS Teacher Champions	4

TAPS Champions.

Ash Jones

Becki Price

Luci Baker



Dawn McCann

It has become a hotbed for innovation in primary science.

"Know more, share more."

Ash Jones, Assistant Headteacher at Milton Primary Academy, kindly agreed to talk to me about his school's engagement with Science Across the City over the past few years. However, it soon became clear that his own professional journey was intertwined with developments in school.

Ash Jones, Assistant Headteacher at Milton Primary Academy

So where does the story begin?

I took on science leadership when I joined the school as a class teacher about 5 years ago. There was an overview of what was supposed to be taught but what was there then is a long way from where we are now. The story of improvement started when I attended a three-day residential course at the National STEM Centre. It was called 'Assessing, Tracking and Monitoring Primary Science'. It was absolutely fantastic and a lot of what we did next was driven by that.

The course was significant because it gave me the impetus to change the teaching and learning of science. Quite soon after that there were noticeable changes made at pace and we were relentless in our desire to improve. Children were 'doing' science; there was enrichment; there were science clubs. There was lots of decision making by the subject leader but at this time it was not particularly informed by pupil voice, staff voice, and parent voice.

> Relentless in our desire to improve.

What happened next?

SATC and Primary Science Quality Mark (PSQM) started for me at about the same time. Because of PSQM, we began to think about the purpose and reasoning that underpinned our decision-making. Our thinking became more joined up, and through PSQM, we became well-informed by a number of primary science stakeholders and our work was rooted by a deeper evidence base. PSQM also introduced us to science capital, which we were developing, but perhaps not for everyone.

> We became well-informed by a number of primary science stakeholders and our work was rooted by a deeper evidence base

During our PSQM year, we took 60 children to the Eden Project in British Science Week and it was hands down the best visit I have ever been on. It was fantastic. The experience of a lifetime for the children that attended. We broke up the journey on the way, visiting 'We the Curious' in Bristol, before then driving on to Cornwall. We were the first school to ever go into the Eden Project at night and it was obviously pitch black, so we were there with our torches, which was so memorable.

The next day we visited the Eden Project in daylight and 'The MAD Museum' in Stratford-upon-Avon. Again, this gave the children a whole new perspective and was such a fantastic experience. That school trip is still spoken about by parents now, even though the children that went on that trip have all moved on to high school. Children right across the school went on other trips for science that same week. It was a real turning point for the profile and culture of science across the school. It showed the lengths we are prepared to go to broaden children's experiences and it was a catalyst for lots of what has happened since and what also continues now.

> Senior leaders saw great value in the way the subject was improving.

Since then, each year for British Science Week we go over and above, but that does not define our science offer – our science offer is not built on tokenistic gestures. As part of working towards PSQM Gilt, we originally drew up 10 'Principles of Outstanding Science' and those enabled us to focus on developing the strength of teaching and learning in science. Senior leaders saw great value in the way the subject was improving, the way it was being managed, and how the profile

of science was being raised. The PSQM journey that science went on was never down to just one person.

The impact of those first PSQM science principles extended across the curriculum because we now have principles for every subject, defining what we see as outstanding teaching and learning. The further thinking then allowed us to refine the original 10 science principles to the six we use now.

Another significant benefit of PSQM and a reason why it was so important to us was because it gave us credibility that we did not have before. Previously, we had been rated by Ofsted as inadequate and it is incredibly difficult to change people's perception linked to this judgement. People in the local area did not know how things had changed but PSQM Gilt gave us credibility. That was a whole school success.

So far you have focused on PSQM, but where does SATC come in?

Around the same time as the PSQM, Science Across the City came along. That for me personally, and for the school, opened a lot of doors and science would not be where it is now without this Opportunity Area project. It works two ways though – we have been able to reap the benefits of so many opportunities that SATC has funded, but we have also been able to share our learning with other schools across the area.

In 2020 I went on a Teacher Assessment in Primary Science (TAPS) course with Sarah Earle, which was hugely significant in terms of my involvement in SATC. I went on that training as part of cohort one and following that Tina asked for expressions of interest for TAPS Champions, so I put myself forwards. Becoming a TAPS Champion, enabled me to start doing outreach activity supporting other schools. As we discussed, Milton has come from inadequate six years ago to good a few months ago, so getting to a position where we were, and still are, outward looking has been a huge shift.

> We have become really reflective.

At that point, we developed our assessment systems even further and we refined our curriculum. This supported us in making really clear links between assessment, curriculum and pedagogy. Throughout the whole process, we have become really reflective. We have tried things and perhaps learned that they were not the best thing for our school. The willingness to experiment with and an openness to new ideas has really enabled us to make good progress.

The robustness and the credibility of what we are do at Milton has been recognised externally by Ofsted we believe that science is a flagship subject at our school and without Science Across the City, this would not have been possible.

To borrow Tina's question; SATC, so what?

We have built a strong primary science community in Stoke-on-Trent over the past few years. There are now links between schools, professionals and the wider world which simply were not there before. I have relationships with other schools across the city that I would never have established if SATC had not come to fruition. There is a school near to us where through SATC brokerage, I ran a couple of staff meetings and now the two schools are building a relationship, so it has opened doors and really helped to build systems that are sustainable.

> Really helped build systems that are sustainable.

To give a further example, British Science Week this year gave us an opportunity to collaborate with classes across the two schools linking up via Zoom. A joined up whole-school science day meant that children were able to share the results of the investigations that they had all completed during the day. That was something that was really well received by our children because they had never done anything like that before and emulates the process of working scientifically with international data sharing.

To summarise, as part of a small academy trust, networking is sometimes difficult for us, but SATC has really helped to overcome this. It has also helped to overcome similar challenges in other schools, and everyone is welcome to visit Milton to see what we do. It has never been about 'we do it this way and that is right'. No matter if you are a coach or a champion, there is no assumption that everything is perfect in any one school. What has been developed in SATC is a real open-door community. When our Year 5 children were at the theatre last week (in March 2022) to watch a science show that all schools were invited to, you could really feel this ethos and people were talking to each other about science. There was a real buzz and sense of belonging.

> There was a real buzz and sense of belonging.

Now please tell me more about your own professional development.

Having been successful as a TAPS Champion, I was invited to become involved in science reviews in other schools and that further developed my confidence, especially through shadowing others as I developed in the role. Significantly though, SATC scaffolds your growth so there is not one big step; you build up to it. Going into other schools and doing

"Know more, share more."

deep dives, even when the school is at a different point in their journey to ours, always leads to learning opportunities for me personally and therefore my own school also.

I take an interest in educational research and the way things are moving; initiatives and current trends. The ethos in our school is one of being reflective and outward thinking. As an example, when Ofsted released their series of research reviews, Milton staff were fully engaged. As subject leader, I summarised the science one and what I produced is now useful to us, published, and available to other schools. When Jasper Green, Chief Ofsted Inspector for Science presented in Stoke I was able to show him the summaries. This was really significant for me personally and a great opportunity to discuss current issues with experts in the field. There is far more impact on children's learning by sharing things such as this through the forum created by SATC, as opposed to tweeting about it, posting in Facebook groups or keeping them to yourself. SATC has given teacher-led documents like this summary of research a real audience across like-minded peers.

Ash's summary of the Ofsted Research Review: science can be found on the SATC website at https://www.scienceacrossthecity.co.uk/ofsted-science-research-review-key-point-posters/

Most recently, I have also developed a tool to audit the quality of a science curriculum, drawing on the TAPS pyramid model. SATC is responsive and invests in innovation and teacher led development. The other SATC coaches then encourage me to reflect and to create something that is even better and has potential use to the wider sector beyond Stoke. If there is nothing out there already, we can develop it, and that is the ethos across the city.

The latest version of this curriculum audit tool can be found opposite.

In terms of my own career, without SATC, I just would not have got to the professional position I have. I have just been given the opportunity to take on the role of Co-Head of Academy to cover maternity leave at Milton, and that shows a level of confidence in me as a professional, and in the work that I do in our own school and others through SATC. There are a number of people across the city who have all achieved remarkable things as a result of the part they have played in SATC. These achievements, in my opinion, are borne though opportunities, and this has made a big difference particularly when the team learn both from and with each other.

So What?

We have built huge capacity across the city for quality teaching, learning and leadership of science. SATC has always been really keen on sustainability. Lead science teachers developed as part of the project are here in the city and able to stand on their own two feet. Once the landscape changes and funding through the Opportunity Area diminishes or stops, collaboration between science professionals can continue.

Through signposting, SATC has given us access to so many primary science stakeholders and I hope that it will continue to join the dots and signpost to events organised by others. It opens doors but it also points you to doors that other organisations are opening, and this will no doubt be really important as we move forward individually, as schools, and also as a city.

SATC can join the dots and signpost to events organised by others. It opens doors but it also points you to doors that other organisations are opening.

The Science Curriculum Audit Tool *(v2)*

Not Evident
Somewhat Evident
Clearly Evident

Intent

Leaders have a clear and ambitious vision for providing a high-quality science education for all pupils. **IN1**

- Curriculum plans break knowledge (i.e. complex NC objectives) into meaningful 'chunks' (knowledge components). **IN2**
- Curriculum plans ensure children develop a full range of 'working scientifically' skills. **IN3**
- Curriculum plans ensure children develop scientific skills (working scientifically) in the context of the five enquiry types. **IN4**
- Curriculum plans identify key vocabulary and the point at which this should be introduced. **IN5**
- Curriculum plans take account of and are coherent with what is taught in other subjects. *Where there are differences, these are made explicitly clear to pupils and teachers.* **IN6**
- Curriculum plans identify scientific misconceptions and there is a shared understanding of strategies that may be used to address these. **IN7**
- Curriculum plans identify opportunities to develop science capital. **IN8**
- Support is provided to develop teachers' science subject knowledge, especially those teaching outside their area of expertise or in the early stages of their career. Teachers therefore have good subject knowledge. **IN9**

Implementation

Planning and Delivery

- Children revisit previously taught knowledge, but there is an expectation that this is remembered rather than retaught. **IM1**
- Substantive knowledge in component parts is introduced so that new learning builds on prior learning and content becomes more challenging. **IM4**
- Teachers successfully adapt the curriculum, without compromising its ambition, in order to meet the needs of pupils with SEND. **IM5**
- Disciplinary knowledge is taught alongside substantive knowledge in a range of contexts, and never assumed to be a by-product of engagement in practical activities. **IM6**
- Children are given time to consolidate new learning through repeated practice and activities, and new learning is not introduced until prior learning is secure. **IM7**
- Practical work forms part of a wider instructional sequence and pupils have sufficient prior knowledge to learn from the activity. **IM2**
- Children have opportunities to learn about the work of a diverse range of influential scientists, inc. those who are still alive. **IM9**
- The resources used to implement the curriculum match what the curriculum expects pupils to learn. **IM10**
- Teachers carefully choose activities to match the curriculum intent and these are suitably demanding. **IM11**
- Any remote education is well integrated and well designed to support the wider implementation of the intended curriculum. **IM12**

Assess.

Teachers frequently check pupils' understanding of the intended curriculum. **IM13**

Assessment is a complex and extensive process. The recognised, suggested audit tool for science assessment is that of the **TAPS Pyramid: LINK*

Impact / Outcome

- Pupils know and remember more as a result of the implementation of the curriculum. **OU1**
- The implementation of the curriculum ensures that pupils' science capital is heightened. **OU2**

*Measuring the impact of a school's curriculum and understanding the experience children have learning science may be supported by cross referencing to current research such as that of **The 10 Key Issues with Children's Learning In Primary Science In England:** LINK

With thanks to Science Across the City (Stoke-on-Trent) for their support in the development of this audit tool.

PSQM and SATC: A symbiotic relationship.

A simple and quick compare and contrast of PSQM and SATC, two organisations active in Stoke-on-Trent, shows that they both have a four letter acronym! They both focus on primary science; they both develop communities of practice; and they both demonstrate fully the DfE standard for effective CPD.

Tina Whittaker
PSQM Senior Regional Hub Leader and Co-Lead SATC.

1. Professional development should have a focus on improving and evaluating pupil outcomes.
2. Professional development should be underpinned by robust evidence and expertise.
3. Professional development should include collaboration and expert challenge.
4. Professional development programmes should be sustained over time.

And all this is underpinned by, and requires that:

5. Professional development must be prioritised by school leadership.

Figure 1 - The DfE Standard for Teachers' Professional Development

Primary Science Quality Mark (PSQM) is a National formal accreditation process through which a school submission of evidence of impact is formally reviewed and validated by an external body. A school is supported over a year to use a PSQM framework from which to audit priorities, identify CPD needs, then create and implement an action plan. Science Across the City (SATC) is different because it is a localised and contextualised programme of professional learning to upskill the workforce in Stoke-on-Trent. Schools buy into PSQM with a joining fee while SATC has been very fortunate to be an Opportunity Area funded service for state schools.

These two organisations stand alone, independent of each other and one can exist without the other. The significant similarities that both SATC and PSQM share is the overarching goal of school improvement through enhanced systems leadership and the commitment to developing quality science experiences for all children.

So why would a school choose to engage with both? Why is this not simply twice the work and double the trouble? Is a symbiotic relationship possible in design and in practice? What is the benefit or win-win for a school accessing both PSQM and SATC simultaneously?

Together at strategic design stage, the SATC team asserted the potential impact of bringing nationally recognised CPD offers to the local area, to increase access, raise profile and stimulate teacher talk around primary science best practice. The bid for funding included a clear plan for evaluation of success and that the evidence impact would not increase teacher workload as it would come from each school's PSQM submission.

<table>
<tr><th>PSQM</th><th colspan="2">SATC</th></tr>
<tr><td rowspan="3">School to Engage in PSQM
• Audit
• Action planning
• Implement action plan
• Submission of evidence</td><td colspan="2">Offers of CPD intervention provided by SATC,
Select either column 1 or column 2 according to school need (possibly identified during the PSQM audit)</td></tr>
<tr><td>Implement Thinking Doing Talking Science (TDTS)</td><td>Implement Teacher Assessment in primary Science (TAPS)</td></tr>
<tr><td colspan="2">Reflect upon the impact of the intervention through pupil voice, teacher voice, headteacher voice, pupil work samples, sample teacher planning, inspection data etc</td></tr>
<tr><td colspan="3">Submit evidence for external review. School receives individual recognition
- A Primary Science Quality Mark and Funders receive validated outcome</td></tr>
</table>

Table: Exemplification of SATC model (Year 1)

Combined impact for subject leaders

While SATC provides the knowledge for science subject leaders to develop science teaching and learning, the commitment of the whole school community working to gain a PSQM enables science subject leaders to have their voices heard more loudly in school and provides a strong message that changes are necessary.

Presenting an analogy - The Fish and Chip Shop!

To source the fish for the fryer there needs to be a net as a tool for the catch and a plentiful supply of quality fish that is desirable to hungry customers. Not having a net makes the process longer and harder but not impossible. Having a few fish across a large expanse of water makes the process longer and harder but not impossible.

Can it be suggested that the PSQM framework is the fishing net (or tool) and that SATC ensures there are plenty of the right type of fish to catch in the now owned school net?

Without PSQM schools might be tempted by the pickled eggs or battered Mars bars. There is the risk of a scenario where funding for lots of CPD is available without clarity on what are appropriate choices from the menu.

Without SATC more schools might need to look harder and further to access evidence-based interventions. There is a possibility of over reliance on local networks, with interpretations (and possible misinterpretations) of information from secondary sources. Returning to the analogy, without SATC you might just nip to the chip shop for an easy solution but not necessarily the healthiest one. In summary because of the co-existence of SATC and PSQM there are readily available nutritious solutions to meet known dietary requirements.

Legacy benefits

The PSQM Outreach kite-mark defines a school that is able and keen to support other schools. There are currently three outreach schools in Stoke-on-Trent and another four in progress, representing 9% of the city schools by September 2022. These schools can be readily identified and empowered to contribute to a city-wide cross organisation infrastructure. The SATC goal of capacity building has been realised through the PSQM Outreach certificate.

But other PSQM certification is available in the form of either PSQM or PSQM Gilt. Since the start of SATC 41% of city schools have achieved PSQM recognition*, a further seventeen schools are either awaiting their submission review or expect to submit in June 2022. These schools have formal recognition of the on-going importance of science to their community and its important strategic value.

In summary

The symbiotic benefit for schools of combined engagement with PSQM and SATC is more focussed leadership, giving the science subject leaders authority and agency to enact change through increased engagement in the STEM landscape of resources and opportunities.

The symbiotic benefit for the PSQM and SATC teams is the existence of a geographical hot spot of engagement, raising and increasing the value and importance of science as a core subject. Indeed, in Stoke-on-Trent, success is leading to further success with demand for science CPD increasing as the impact is evident.

Science ACROSS THE CITY

PSQM Primary Science Quality Mark® PSQM

* Nationally 5.1% of all primary schools achieved PSQM schools in a similar timeframe to the SATC reference above.

The Cast and Crew

Producer

Olivia Stanyer

Crew members

Script: Tina Whittaker
Editor: Clare Warren
Adviser on set: Karen Peters
Creative design: Mark Cartledge

Starring

Abbey Hulton Primary School
Alexandra Infant School
Alexandra Junior School
Ash Green Primary Academy
Ball Green Primary School
Belgrave St. Bartholomew's Academy
Burnwood Community Primary School
Carmountside Primary Academy
Christ Church CofE Primary Academy
Clarice Cliff Primary School
Eaton Park Academy
Etruscan Primary School
Forest Park Primary School
Gladstone Primary Academy
Glebe Academy
Goldenhill Primary Academy
Greenways Primary Academy
Grove Academy
Hamilton Academy
Hanley St Luke's CofE Aided Primary School
Heron Cross Primary School
Hillside Primary School
Holden Lane Primary School
Jackfield Infant School
Kingsland CofE Academy
Maple Court Academy
Mill Hill Primary Academy
Milton Primary Academy
Moorpark Junior School
New Ford Academy
Northwood Broom Community School
Norton Le-Moors Primary Academy
Our Lady and St Benedict Catholic Academy
Our Lady's Catholic Academy
Packmoor Ormiston Academy
Park Hall Academy
Portland School and Specialist College
Priory CofE Primary School
Saint Nathaniel's Academy
Sandford Hill Primary School
Sandon Primary Academy
Smallthorne Primary Academy
Sneyd Academy
St. Augustine's Catholic Priamry School
St. George and St. Martin's Catholic Academy
St. Gregory's Catholic Academy
St. John's CE (A) Primary School
St. Maria Goretti Catholic Academy
St. Mark's CofE (A) Primary School
St. Mary's Catholic Academy
St. Mary's CofE Primary School
St. Matthews Church of England Academy
St. Paul's CofE (C) Primary School
St. Peter's Catholic Primary School
St. Teresa's Catholic (A) Primary School
St. Thomas Aquinas Catholic Primary School
St. Wilfrid's Catholic Primary School
Star Academy Sandyford
Stoke Minster CofE Primary Academy
Summerbank Primary Academy
Sutherland Primary Academy
The Meadows Primary Academy
The Willows Primary School
Watermill School
Waterside Primary School
Weston Infant Academy
Weston Junior Academy
Whitfield Valley Primary Academy

01782 234440
Park Rd, Stoke-on-Trent ST6 1EL

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