Science ACROSS THE CITY

CONNECT

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

ISSUE 1: Seven Stories of success MAY 2021

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 2	Better Reading-Better Science	Practitioner research, I tried and the difference I saw, or heard was…
Issue 3	Learning Communities	From engaging with expertise, to embedding learning specifically
Issue 4	Innovation from Stoke-on-Trent	Gifting and sharing new development in science. Celebrating creative problem solving from teachers working collaboratively.

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	**EEF**	Education Endowment Fund
TAPS	Teacher Assessment in Primary Science	**PSTT**	Primary Science Teaching Trust
SPOTY	School physicist (scientist) of the year	**CALM**	Compare adjust listen make meaningful (An approach to science catch up curriculum planning)
BEST	Best Evidence Science Teaching	**ASE**	Association of Science Education
SAT	Statutory Assessment Test	**CSci Teach**	Chartered Science Teacher

CONTENTS

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

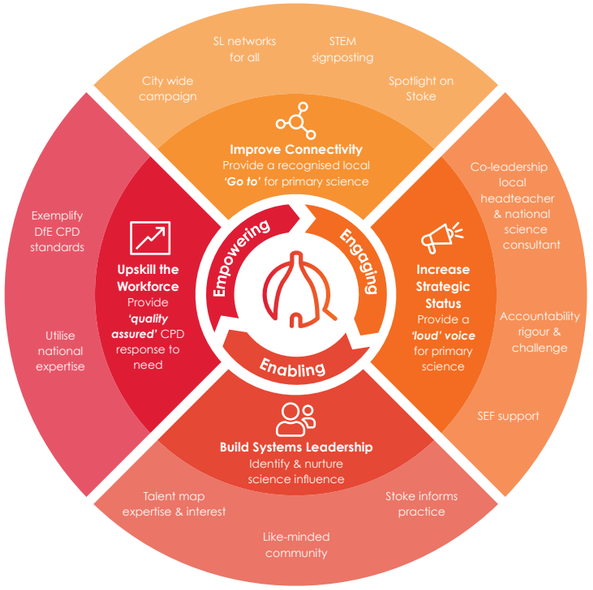


Fig1: SATC, What we do, and Why. Strategy Plan 2019

Science across the City, (SATC) created a vision for every child, in every classroom, in every primary school across the city of Stoke-on-Trent to experience quality science education that encourages and builds creative and critical thinking for the next generation.

The strategy, launched in 2019, set out to better connect schools with each other and with National best practice, creating a professional community that would lead to collective development and positive change. To improve the quality of science teaching and learning the strategy identified both the change agents, and the messages that would effectively communicate a campaign for primary science. An ethos in which every school development plan focused on the shared value and importance of science would be built. School improvement outcomes were to be driven through professional development implementation of the five standards from the DfE model for effective CPD, (2016).

The reality both Nationally and locally when devising a primary science intervention strategy was a picture of huge variation of pupil experience, largely dependent upon the confidence of individual teachers and the value and status of the subject in different schools. There were pockets of excellence but all too often excellent teachers were working in isolation and often their knowledge and skills went unrecognised.

Secondary school colleagues would comment that many children joined year 7 having not experienced science in their school year prior to transition. Equity and quality for every child were and had to be the goal. Inclusion and aspiration, life chances and opportunity were the drivers behind the request for Opportunity Area (OA) funding submitted by Karen Peters, and Tina Whittaker. Karen and Tina are connected by their passion for their City and science, the forgotten core subject, as a route for life-long learning.

Amanda Spielman, HM Chief Inspector of Education, in her commentary of 2018 summarised the unintended consequences of the removal of science SAT testing in 2009 and the subsequent de-valuing of primary science. Through a programme to upskill the teaching workforce and investment in systems leadership, the Science across the City project set out to improve life chances of those disadvantaged by the curriculum emphasis on English and mathematics at that time.

Our principles of practice

1. **Putting staff first**. SATC provides a CPD offer to facilitate professional learning regardless of career stage. The project was designed to have something for everyone and provides a universal offer to all primary schools.
2. **Humans first, professionals second**. SATC provides empathetic teacher subject coaches, with much hand holding and encouragement to know when to challenge and when to be kind.
3. **Not reinventing the wheel**. SATC develops strong links with expertise and experts within a contextualized and local framework providing sustained multiple day programmes, including recognised quality assured CPD, (TDTS, TAPS, PSQM.)
4. **Success breeds success.** SATC explicitly seeks to identify and praise the strengths of the teachers in our City. We formally acknowledge and celebrate success through accreditation, including the PSQM, SLP facilitators, PSTT fellowship, CSci Teach status and of course SPOTY too.
5. **Pride in our City**. SATC gifts and shares innovation developed in Stoke-on-Trent beyond the city, as, after all, why should others need to re-invent the wheel. We are proud to be putting a spotlight on the great practice in Stoke and waving the flag for both primary science and our community.

After two years, remaining true to our principles and committed to the strategy, even with COVID challenges, we are determined to evidence the impact and dramatic changes achieved through the actions completed to date. How do we know that we have made a difference? What has been the impact of the OA investment? What will be the legacy of two years of unprecendented activity?

Initially, we anticipated impact would be demonstrable through a closing of the KS2 science data gap (city/National) and a teacher-led conference would celebrate and disseminate outcomes in May 2021. Sadly, it became clear neither of these would be possible due to policy change (COVID-19). And so it was, from a professional ponder combined with resilience and grit, a city-wide action was hatched. COVID-19 had put a stop to our plan A but plan B is bigger and better, reaching a much wider audience and offering a greater legacy. With the support of our editor, Clare Warren, we are sharing outcomes by telling the stories of success, putting a spotlight on primary science education in Stoke on-Trent. We hope that you will both read and contribute to, Science across the City: A Journal of professional development in Stoke-on-Trent, and that it will help you to reflect upon your own classroom practice and the wonderful professional culture across the City.

We spend a lot of time thinking about how to measure success. Are we hijacked by the notion of x causes y? We need to spend more time focussing on stories and narrative because success looks different for every individual or school.

Welcome Summit, Nov 2020

Enjoy

Tina Whittaker & Karen Peters

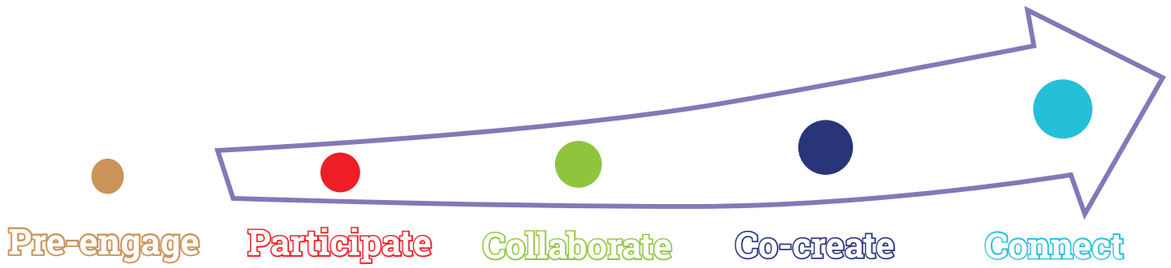
Reflections from the Editor

A very warm welcome to the first issue of Science across the City. The journal of primary science development across Stoke. Having spoken to many of the science subject leaders featured and learned about their development, it was with great pleasure that I accepted the opportunity to guest edit this inaugural issue. Something very special is happening to primary science in Stoke and this journal will explore some of the changes in depth and consider what lies behind them.

The first article, a collaboration between Lynne Bianchi, Tina Whittaker and Karen Carney, relates the theory of change model used in designing the project to Karen's experience of her own development through participating in Science across the City. The article notes the dynamic nature of the trajectory for the development of professional leadership (ToPD) model (Bianchi, L., 2017) and the importance of the spaces between phases. This helped me to make sense of Karen's continued participation and collaboration even as she connected and co-created.

Clare Warren

The second story features Emma Edwards who took on the role of science subject leader when she started teaching at Christ Church. Her claim to be, 'like a rabbit in the headlights; not knowing where to go' was indicative of her pre-engagement on the ToPD. However, through her participation in the Science across the City (SATC) network, and collaboration with her colleagues, she has made significant changes to science teaching and learning across her school and these are described in the article. She now makes the proud boast that the pupils at Christ Church have become scientists!



Adapted from Bianchi, L. (2017) 'A trajectory for the development of professional leadership in science education', Journal of Emergent Science, (12), 72–83 See in full here

'Every teacher needs to improve, not because they are not good enough, but because they can be even better'

Dylan Wiliam

One of the things I found most remarkable about the project was the way in which relatively newly qualified teachers like Jen, the subject of the third article have been able to power through the ToPD. Her rapid rise from pre-engagement as an NQT where she taught few science lessons, and certainly did not see herself as a 'scientist', to her appointment as a Science Influencer, where she is now empowered and inspired to connect with others has happened so quickly. This is even more notable when we consider the impact of a global pandemic on schools and teachers, demonstrating the resilience of Jen and thousands of teachers like her.

Our fourth and fifth articles feature Imtiaz, another new science subject leader, who, like Jen, quickly rises to the heights of Science Influencer. In contrast to Jen, he had a background in science and passion for the subject at the start, but it is interesting to note the ability of them both to progress speedily through the trajectory. The role of Emma, his head teacher, was an important influence in Imtiaz's story and part two considers Imtiaz's development and the improving quality of science teaching and learning across the school from Emma's perspective.

For me Lucy's story focuses on her ability to co-create resources that have been used in collaboration across the city. The idea of Potterbots rampaging across Stoke and surrounding areas has captivated me, as I'm sure it captivated the children who became part of this city-wide initiative. The coverage in the Guardian is a wonderful testament to Lucy's work and a great reflection of the whole SATC project.

Becki, in her role as Science Influencer has already appeared in Jen's story, but the penultimate article tells Becki's own story and explains the importance for her of being part of something bigger. For me this emphasises the Collaborate and Connect elements of the ToPD. Interestingly the Department for Education Standard for teachers' professional development states that professional development should include collaboration and expert challenge and these elements are very apparent in Becki's story. I can see how Becki has similarly influenced Jen.

The final story of this issue tells the story of Dawn who is the most experienced yet most modest of the science subject leaders featured. For me Dawn embodies the Dylan Wiliam quote above. She is more than good enough yet aspires to be better still. Her passion for science and for supporting children throughout Stoke to expand their horizons and achieve great things in the world of science, is such a superb way to draw this issue to a close.

Thank you all for letting me play a small part in telling the story of the development of primary science teaching and learning in Stoke. I can't wait to read the next issue – Bring it on!

Clare Warren

"Connecting research, strategy and practice"

In conversation with Karen Carney - A Science Influencer with Science Across the City (SATC)

What is ToPD?

The Trajectory of Professional Development (ToPD) (Bianchi, 2017) is a theoretical model to describe teacher engagement in socially constructed professional learning opportunities. It is described in 5 phases: pre-engagement, participation, collaboration, cocreation and connection. Although depicted in 2D form with a linear and upward-orientated trajectory, more realistically this should be thought of as a dynamic model where the space or journeys taken between the phases lead to key learning gains for the teacher. There is no intended judgment that one phase is 'better' than another but that a teacher can benefit at any stage. The model supports professional learning for the right teacher, at the right time, on the right issue.

How did Science across the City use the ToPD model?

This primary science project is funded through the DfE opportunity area initiative against the enabling theme of upskilling the workforce.

ToPD informed the strategic plan for differentiation and a universally relevant CPD offering. Sustained, collaborative and rooted in expertise, three communities were established to meet needs: assessment in science, teaching approaches in science and leadership in science. Each theme was mapped against ToPD and the project funding used to enable learners to move between the phases. This model drives legacy with the development, of well-informed practitioners in classrooms, who are also connecting beyond their school and city.

Why have you asked Dr Lynne Bianchi to interview Karen Carney?

Karen is an experienced subject leader who loves learning. She has embraced CPD from many providers for many years.

Through SAtC Karen has taken on many roles that were designed to be enablers and empower practice, including Science Influencer, TDTS champion, SLP facilitator, subject coach and she also gained CSci Teach accreditation. It was of interest to know if Karen would recognise her journey against its intentions and design.

In conversation with Karen Carney

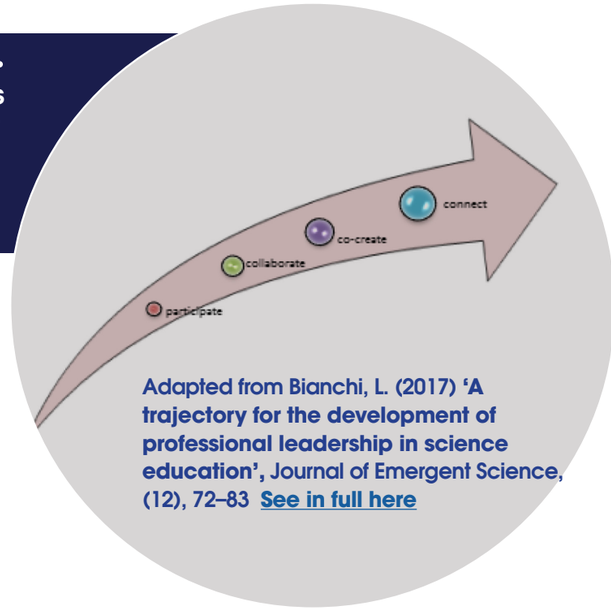
I'd been Science subject leader at my school. We just plodded along and everything was fine. Then I became involved in SATC and joined a network of science leaders who inspired me to take a look at wider opportunities. Other people in the group were doing things that I hadn't embraced yet, so I took their advice, started to **participate** and found I really enjoyed it.

My background is Science – I love it! I pursued science A' levels and a degree so I don't get why other people don't love it too. I perhaps saw myself as the lone scientist wanting everyone to love it just as much as I do. I've always tried to encourage others to **participate.**

The role I have now means I feel more of a **collaborator** and I'm definitely moving towards **co-create.** I'm finding myself taking things on. I'm creative; I enjoy working with other people and developing new ideas. Before getting involved with SATC I was less of a risk-taker than I am now. I've realised that when you take something on that you enjoy, it's worth that extra bit of work.

The model supports professional learning for the right teacher, at the right time, on the right issue.

This early version of the ToPD model relates to Karen's trajectory as a Science Subject Leader and Science Influencer. See the current version of the model on page 6.



Adapted from Bianchi, L. (2017) 'A trajectory for the development of professional leadership in science education', Journal of Emergent Science, (12), 72–83 See in full here

Coming together with the other SATC Science Influencers has meant that we've managed to support each other, sharing ideas and experiences. **It's the creativity and proactiveness of the group that makes it work so well** – and the fact that we all just love science. I've come across so many initiatives and had access not just to training but to thinking. It's been important to have the support of my Head teacher, and for him to see the extra support from Tina too. I now lead by example, encouraging other teachers to review practice and take ideas on. It's so brilliant to see the impact of SATC right across the whole city – everyone wants to be part of it.

My approach is to do things subtlety because I think it's hard enough being a teacher, so I'm there to help, support and encourage the subject leaders. Where possible I visit schools and observe lessons with them. It's important to understand other teachers' realities and let them know I'm here. Eventually when they have the chance they approach me and I support them to think about planning across the school or approaches such as Thinking, Talking, Doing Science. I'm a big one for keeping it simple. I now see that all my schools are **participating** because of the regular signposting I provide.

The fact that I'm part of the SATC community makes me really proud and it's advanced me personally as I've been encouraged to do things like the Primary Science Quality Mark and CSciTeach. Through the **interaction and support** within the group I've thought a lot more reflectively and now I think beyond the obvious. When I'm teaching lesson, I now stopmyself to think 'What's the point?' and 'What do I really want the children to get out of it?'. It's something I'm working to get across to the other schools I work with – encouraging them to think 'So what?' I suppose I'm connecting them with this type of thinking… to encourage them to reflect and be a bit more critical of what we do in primary science and why.

It's not all easy – it's definitely stretched me. The group is very open and honest which I found tough at the beginning when I was being questioned and professionally challenged. It didn't come easily but I can see how I've developed through it and become more confident in my own thinking and practice. I'm now using a similar approach with other schools.

My confidence has grown and the exciting thing is that I understand why that is. It's not just for science either, in maths and English too. I'm more willing to speak to the Head teacher about trying things out too then reflect on their impact. I know I can back up what I do and what I'm saying. I enjoy working in a team and having a balance between teaching and doing the influencing work too. My love for teaching is really strong, and I think it is important to have your hand in the classroom when you're out there advising other teachers. In future, I'd like to keep it that way. By being here in Stoke I am in a really exciting place where so much science development has become the norm – **we're definitely leading the way!**

Reflective comment by Dr Lynne Bianchi

The opportunity to be an SATC Science influencer has undoubtedly afforded Karen ample opportunity to reflect on herself as a learner and professional. By using the ToPD model we can see how Karen has engaged at different phases. Initially, encouraged by senior colleagues to **participate** in a network with teachers from other schools. From which her intrinsic motivation for science meant she swiftly moved to **collaborate**, sharing ideas and approaches, discussing and reflecting. This then, stretched her own thinking. Her confidence grew as she found strength in deeper understanding of her practice, spurring her on to go beyond sharing to applying new understandings of science teaching and learning in **creative** ways. Her influence working outside of her school setting now means she is **co-creating** new learning opportunities with others, and gaining accreditation for it. Her passion for science has always meant that she has sought to influence, and her new role in SATC means that she has the credibility and legitimacy to **connect** with others to offer support and collegiality.

"Building Science Subject Expertise"

In conversation with Emma Edwards from Christ Church CE Primary Academy

Please tell me about science at your school at the start of the SATC project.

In my old school I was leader for RE but when I joined Christ Church I took on the leadership of science. I've not got a background in science and I was a bit like a rabbit in the headlights not knowing where to go. I soon found out the science lessons were mostly based around worksheets and were not practical. Science enquiry was not being assessed, so there was much to do.

How has SATC supported you?

Science across the City introduced me to a wonderful network of local science subject leaders enabling me to find out what others do and share ideas. Some of the Science Influencers have been into school to help me make changes. For example, they have worked with me to develop colleagues' science subject knowledge. SATC has also provided a wealth of CPD opportunities. I have met and been trained by people like Sarah Earle, the researcher behind the Teacher Assessment in Primary Science, and people from the Royal Society of Chemistry. When I come back to school I have so many ideas I can implement and resources to share with my colleagues.

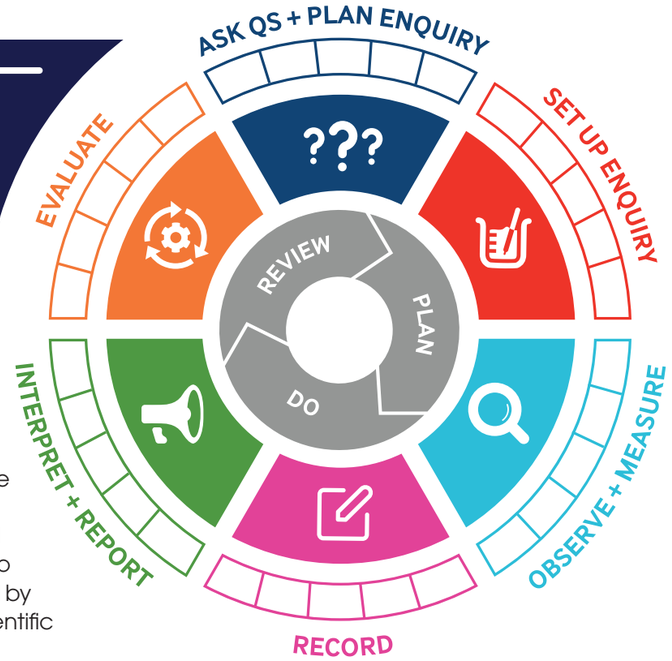
You have really strengthened science enquiry in school. How did you do that?

Melissa Loughran, the SATC TAPS Champion, came into school to facilitate training on science enquiry giving staff practical ideas they could use with their classes. This really boosted their confidence to teach the five enquiry types included in the National Curriculum. I also organised workshops for parents and carers where I gave brief presentations on the five enquiry types and skills. They had an opportunity to engage with a carousel of activities. The feedback from both parents and the Head Teacher was so positive. Parents are now more confident and enthusiastic to engage with science at home which is a real boost for some of our pupils.

Children, starting from their existing ideas, can develop more scientific and powerful ideas about the world through collecting, interpreting and using data.

Harlen, W. & Qualter, A. (2018) The Teaching of Science in Primary Schools. Routledge.

TAPS Working Scientifically Cycle



Also, I created a whole school science display to reinforce the working scientifically cycle and the five enquiry types. As part of science week I set the children a competition to come up with their own scientific questions and investigate them. I was stunned by the way they became more curious about the world around them and began to ask fantastic questions such as 'Why do leaves have patterns?' They are now so excited by science and look for opportunities to discuss scientific questions and ideas.

We now have a school culture where pupils are confident to plan their own investigations, are more engaged and thinking scientifically. They can explain their results and justify their answers. From experience with my class the children are more enthusiastic about their learning when they have more control and they are increasingly likely to remember what they have learnt. It is so empowering for our children to see their own independent achievements.

For colleagues, learning science pedagogy skills like asking effective questions has really impacted on the rest of the curriculum as well. The pupils are also building confidence to be more inquisitive in history for example. They are coming up with their own questions rather than just sitting back. This is all because of the changes I have been able to make with support from SATC.

Please tell me how science assessment skills have developed in your school.

Thanks to being invited to the training with Sarah Earle, I have introduced colleagues to the TAPS approach, and we focus on one part of the enquiry cycle when assessing enquiry skills. This gives the pupils a clear focus and the work produced is now of a much higher quality. It also gives the teachers guidance on what to look for.

In addition, I introduced KWL grids. They give children the opportunity to share what they know and the teachers are picking up on the questions and misconceptions the pupils have that they are then able to address during lessons. For example, one child asked, 'Are there shadows on other planets?' The teacher then adapted her planning so pupils could answer this question.

How would you summarise the impact of being part of SATC?

We have gained a lot, and staff, pupils and parents now realise the importance of science. Staff feel so much more confident and the coverage of the science curriculum has developed beyond all recognition. The pupils are so excited by science, keen to use their developing scientific vocabulary and ask questions about the world around them. They have become scientists!

"Connecting CPD to Classroom Practice"

In conversation with Jen Smith of Etruscan Primary School

Tell me about how you became science subject leader.

I qualified as a teacher in 2016 and when I finished my NQT year there was no one else to take on the role so I ended up as science subject leader. Honestly, I was not enthusiastic about science, especially in high school, so it was very daunting. I knew there were gaps in teaching and learning so I was going to have to be dedicated. I love a challenge, so I jumped straight in.

I did not know what I was doing; I'd only taught a few science lessons as an NQT, so I felt ill-prepared to be science lead. I did a book scrutiny, a pupil voice questionnaire and a SWOT analysis of science teaching and it became apparent there was too much writing. Science lessons weren't rich enough, there were too few practical activities and the children weren't challenged, so I wanted to address those issues.

One of the pupil survey questions was, 'What is a scientist?' At the start the children said they make potions and do experiments. Our children don't have a wide range of life experiences or career aspirations, so it's my responsibility to enrich their learning and broaden their aspirations.

Thomas Guskey (2000) contends there are five levels against which professional development can be evaluated.

1. Participants' reactions
2. Participants' learning
3. Organisation support and change
4. Participants' use of new knowledge and skills
5. Student learning outcomes

Can you find where there is evidence of any of these 5 levels in Jen's story?

Guskey, T. (2000) Evaluating Professional Development

You knew what you wanted to change but how did you go about it?

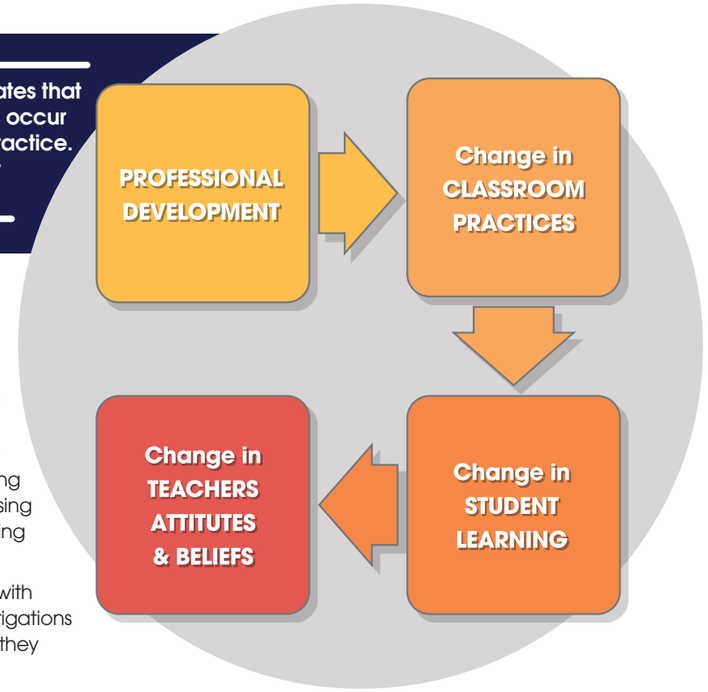
I couldn't have done it without the brilliant Becki who has been a massive support in her role as Science Influencer. We created an action plan based on the areas of science I wanted to develop. She advised that the PSQM would be perfect for our school, 'because you'll be doing this anyway', but cautioned that, 'you can't address everything all in one week'. She was right; the PSQM has given me a great structure and changes take more than a week!

I attended the TAPS course and the Thinking, Doing, Talking Science training. I emailed the headteacher straight away saying this is fantastic. Let's have a go because we need to know if it's successful for us. I love learning from training courses, implementing changes and seeing the effects spread throughout the school. I'm so grateful to my colleagues. Their support and teamwork have enabled me to carry out my role effectively.

Now my thinking is deeper. My slogan is 'So what?'. Why are we teaching that? What is the impact going to be? Why am I doing this monitoring activity? So, for example, I focused mainly on pupil surveys because children will say something that I might not get from a book. They will say what they're confident in or what they do and don't like to do.

"Enable through challenge, Engage with depth, Empower independence"
- A legacy approach in Stoke-on-Trent, SATC 2021

Guskey's model of teacher change indicates that changes in teachers' attitudes and beliefs occur after they see the impact of changes in practice. This is counterintuitive as we might expect attitudes and beliefs to alter during CPD.



So how is science teaching and learning looking now?

Enthusiasm for science has increased beyond all recognition. You can see it in the children's work and their faces. Teachers are saying we've just had a brilliant science lesson and the children loved it. Now the planning is more focused, so the children's learning is more focused. Teachers are using videos; they're using the Explorify website. The quality of learning is improving rapidly and children use much richer vocabulary.

Teachers are also more confident and comfortable with assessment. We assess during child-led science investigations and the children absolutely love it. We see the ideas they come up with, what they do, and what they say.

It has also impacted my teaching in other subjects. We aim to build their vocabulary of the many EAL children in school. In maths we do practical, concrete activities and discuss our learning which reflects my science training. With every subject, rather than panicking about the books, I think 'So what?'. Why am I doing this? What do I want the children to learn?

Floor books seem to answer some of your questions. Why is that?

A floor book is simply a reflection of their learning, including photographs, evidence of practical activities, comments or discussion. Children or teachers can write on post-it notes any lightbulb moments and that's evidence enough. Rather than writing up a whole experiment, two sentences from children who have reflected on their learning is so much better.

We've trialed them in years two and four with huge success and believe they enrich the learning because we're not focusing on work in books and how we prove to Ofsted what the children have done. Discussion and vocabulary have developed significantly. Previously pupils found scientific words challenging, but now they write less they're using scientific vocabulary in a more structured and effective way. What's more, lower ability and SEN children come out of their shells because it's talk-based and doing-based. Now they are so much more confident, and they are some of my highest achievers in science. Teachers in other year groups are excited that from September they will also be using floor books to show off the children's learning.

And in the future?

I was concerned when I discovered how young pupils are when they make up their minds whether science is 'for them'. It is very difficult to change their opinions in secondary school. I realise how influential primary science teaching is and I want to develop community links like science fairs, working with other schools, and having science visitors to enrich experiences so science capital grows. Because of the Covid situation that's for the future. But for now, we start the lesson with, 'today we're gardeners, or zoologists or chemists', so we're opening their minds and they see how science is relevant to their lives.

And now you are going to be a Science Influencer just like Becki.

I'm excited about facilitating training in other schools and sharing floor books. It will be awesome to get everyone involved, share my enthusiasm and organise science fairs or competitions with other schools. I'd love to support schools like mine with high levels of EAL and vulnerable children, making small changes that have a huge impact on children's learning.

THE MEADOWS PART 1:

Building knowledge for a new Science Subject Leader

In conversation with Imtiaz Damani – Science Subject Leader at The Meadows

How has Science across the City impacted you?

When I took on science it was my first leadership position and I needed knowledge to give me some direction. Science across the City allowed me to step away from what's going on inside my classroom and see what's happening elsewhere. Having that network where I can ask, 'Has anyone come across this or what have you done about that?'

It's having options so if something doesn't work you can try something else.

Emma, our Head Teacher, has given me a licence to go and do whatever I think will make science teaching and learning better. I have ownership over it, so based on SATC training, ideas from others in the network, or my own research, I probably go to Emma about once a week and say, 'is this something we could do?', and Emma will say, 'OK, give it a go'. Emma has now nominated me to become a SATC Science Influencer so I can begin to share my growing knowledge and skills with other teachers in Stoke.

How would you describe science teaching and learning at The Meadows when you became science subject leader?

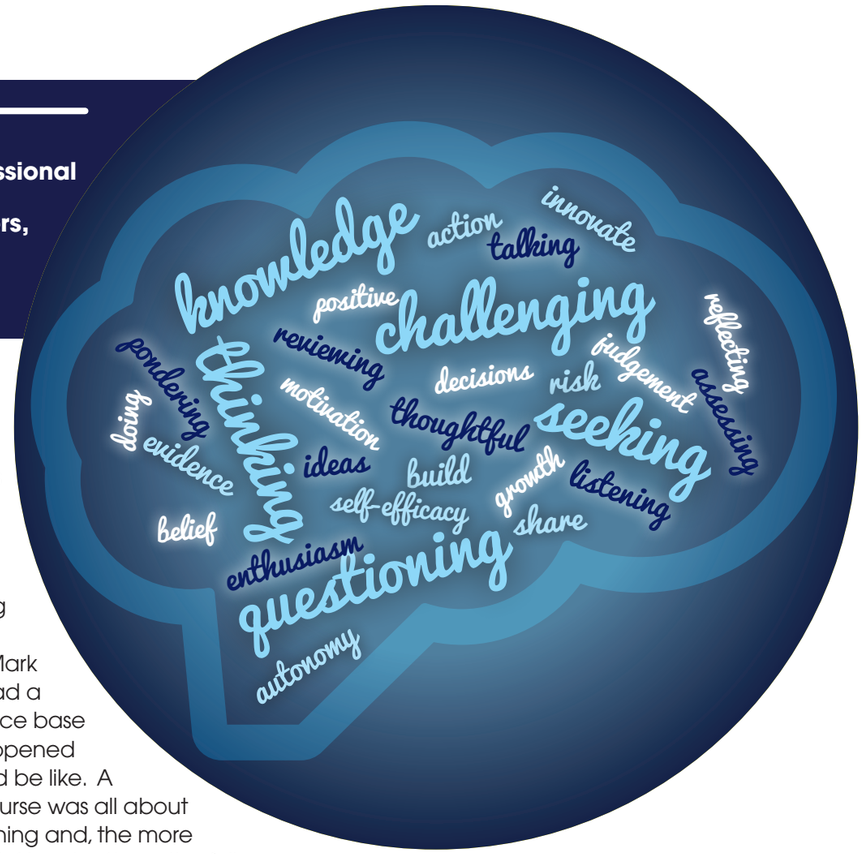
Science at The Meadows had been very static. We were doing what we'd always done; we'd do an investigation and then spend one or two lessons writing it up, including the aim, the methods, the equipment, the results, the conclusion. It was stale and lots of children, especially those less skilled at writing, would copy off the board. None of the children enjoyed the writing and it was hard for teachers to enjoy the lessons. It was easy for me because we started in a place where we needed to change everything, and

I had the freedom to go with what the SATC training had indicated was best for the children.

'Teachers becoming more expert in their areas of strength may have more benefit than focusing on an area of weakness'

Wiliam (2018)

SATC enables the development of professional learning schema in science subject leaders, connecting ideas and practice



How did SATC support you to make the changes you needed to make?

The training SATC offered all aligned and got us headed in the right direction. The Thinking Doing Talking Science (TDTS) and Primary Science Quality Mark (PSQM) training ensured we had a vision and provided an evidence base to improve science. The TDTS opened my eyes to what science could be like. A target to build towards. The course was all about how taking risks can drive learning and, the more risks we take, the better we get. You don't see the full impact straight away. They signposted me to different resources and websites like Reach Out CPD, which was so useful to myself, and now my colleagues are using it too. The network includes so many people sharing tips that worked for them and then I bring them back to school.

So, how has science teaching and learning changed?

Now the children are enjoying the whole science learning experience. It is more practical, hands-on and child-led. They are more confident and empowered. Every lesson starts with a 5-10 minute discussion then children make decisions for themselves, using what they have learned before, talking to each other and taking risks. We have a focus on one Working Scientifically objective. For example, the conclusion might be the only thing written in books. We will have photos of the experiment so there is evidence, but the writing will focus on hitting a single skill. Now pupil voice shows that 93% of pupils enjoy the experiments, and they certainly don't miss the writing. They like learning off each other and we have been thrilled by the perceptive answers from children you might not expect to be thinking so deeply. Having more chances to embed those skills is ultimately what is going to make our children great scientists

THE MEADOWS PART: 2

A Head Teacher drawing on Science Across the City to empower and enable subject leadership

In conversation with Emma Gater, Head Teacher at The Meadows

Tell us about science at the start and how you became involved in Science across the City.

When Imtiaz took on the role of science subject leader the quality of science teaching and learning lagged behind English and maths because of the high stakes SATs tests. In seeking opportunities to get writing into science, the science was becoming lost, hindering children's progress. It was Imtiaz who identified that and that we needed to make changes. Science is a core subject and it needed to become an important element in our broad and balanced curriculum.

Imtiaz has a master's degree in science and has worked as a scientist. I challenged him to raise the profile, but we had no tools to give him. So, I was excited about the possibilities when I heard about Science across the City. We said to Imtiaz grab it with both hands – really take the subject forward – whatever you want to do. We gave him the power and capacity to do that.

As a school we try to be reactive to the needs of our staff and encourage them to take risks, like the children. We accept they won't always get it right first time. We recognise that Imtiaz is passionate about science and that he can make a big difference. I'm not a scientist and I need a science expert in school to inform me what's best for the children and I trust Imtiaz to do just that.

He apologises for mithering me and I want him to keep mithering me

– it's great to have someone who is so enthusiastic about science.

Please tell us about the way Imtiaz has risen to the challenge of developing science teaching and learning

Imtiaz audited science across the whole school and identified the strengths and areas for development. He's been incredibly proactive, not just cascading his learning from courses but he's an excellent practitioner and models the changes he asks colleagues to make. Teachers respond so positively to his approach.

Nothing happens by chance.

There's been a lot of work that's gone in to it

SATC offers great support for Imtiaz to lead this important subject and he is constantly dipping into the community of like-minded people. He has become truly empowered and such a confident subject leader.

'It is not enough to consider what teachers need to learn. We need to make schools places where teachers thrive and grow'

Weston (2021)

SATC supports schools to meet their mission.

Sowing the Seeds of Success

So, please tell us about how science teaching and learning have developed

As a school there has been a huge shift to thinking scientifically that has impacted the work in books. A book scan identified a few weaknesses and straight away Imtiaz addressed the issues, doing it in such a proactive way that staff go with him. They don't feel singled out; they feel nurtured to go on that journey together.

I was really lucky to be able to teach one of Imtiaz's year 5 lessons and the children were so confident with the lesson structure.

Previously there would have been a prescriptive approach but now they are able to investigate independently.

Now there are children who've realised they are very good at science, even if they may not be the best writers. We want to have scientists; we want children to explore, to make mistakes in a really safe environment, and genuinely love their subjects. We want to we set our children up for the best possible chance of success with science.

Typically, children in this area have low aspirations. It is going to take time to undo some of the negative views of science but if we keep chipping away then over time we can encourage children to consider routes they might never have thought of and open up the world of science to them.

What else would you like to say about Imtiaz

Imtiaz is an expert. He has been empowered to take that love of science and has the drive to move it forward. For our children he is a role model; somebody who has really embraced science. He's always thinking about 'what next?,' so I was delighted to nominate him as a Science Influencer. He's incredibly proactive and passionate, but in a quiet way.

We have undoubtedly raised the profile of science but now we need to maintain that momentum. Because Imtiaz is part of that SATC network of like-minded, science education professionals, I know he will keep improving science teaching and learning. There's lots of talk about legacy and in this school Imtiaz, with training and support from SATC, has created a group of staff who are genuinely empowered in science.

“Building meaningful connections”

In conversation with Lucy Holdcroft of Moorpark Junior School – the Science Influencer behind Project Potterbot

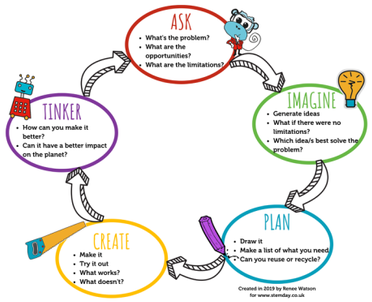
Where did the idea for Project Potterbot come from?

It sprang out of a simple Zoom conversation thinking about how Science across the City can support teachers during Science Week. Through the pandemic they have worked so hard to create the best learning experiences for pupils both at home and in school. At that point we didn’t know if we would have most children back in school by Science Week and it was another burden weighing on teachers shoulders. Initially one of the concerns was how to get children at home engaging in the same activities as their peers in school. What teachers needed was a ready-made set of Science Week resources to make their lives easier. To make it more special we decided to go City-wide.

Through the pandemic we have been spending more time learning, working and staying at home than ever before and machines are increasingly being relied on, so that’s a real context for the investigation. We used the idea of a machine learning themed Science Week based around Potterbots.

So, what is a Potterbot?

A Potterbot is a special Scribblebot created in the Potteries! Children collect scrap materials and combine them with other resources to make their own imaginary learning machine. They imagined it, they designed it, they evaluated it and they tinkered it. They’ve been through the whole process of being a scientist and an engineer and it’s just been amazing.



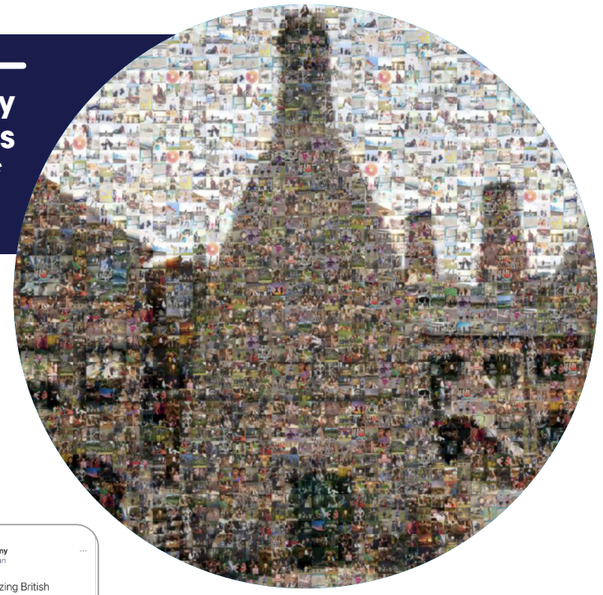
Who else collaborated in Project Potterbot?

After the initial idea about machine learning we found the Royal Society had published resources similar to the ones we envisaged, so we contacted them and were thrilled when they agreed to collaborate. So I took their resources then adapted and built on them. We spoke to Renee from Curiosity Box and she was excited to be involved in creating the resources. Some local STEM Ambassadors recorded 5 minute interviews so pupils could see and hear people talking about their STEM careers. I must also mention the Ogden Trust has donated kits to local foodbanks, and when we have finished with our kits we plan to do the same.

I didn’t really feel qualified to work with these organisations because this is only my fourth year teaching and second year leading science. But just having a small idea, being part of it and watching it grow – it’s been remarkable how it’s progressed.

Through the pandemic we have been spending more time learning, working and staying at home than ever before and machines are increasingly being relied on, so that’s a real context for the investigation.

This image of the Gladstone Pottery Museum is a mosaic of 2000 pieces of pupil work - explore them HERE*



How big did it grow?

We invited schools to join this free collaborative project and initially we had about 30 schools. Then we arranged some on-line sessions so teachers could find out more – by then we got up to 50. We said tell your friends in other schools and by last week we had 72 schools. We’ve had a few Staffordshire schools sign up as well which makes it broader than Science across the City. In the space of 4 weeks we achieved all of this. It is so exciting to be part of it.

The basic Potterbot activity can be adapted to a wide range of ages and although we designed the resources for years 5 to 8 we have had Infant Schools and High Schools sign up so the project is also supporting transition between schools.

What part did you play?

I created some ready-made plans for teachers to give the children a basic understanding of machine learning using the resources already available from the Royal Society. These run alongside the main Potterbot activity. When I was asked to present the resources to other schools in a live Zoom session that was a big step for me, quite nerve wracking but it gave me a real sense of achievement. I now have so much more confidence.

Tell me about the mosaic

One of the most exciting things is the online mosaic. Schools have been able to take pictures of the children’s creations and upload them to create a mosaic in the form of Gladstone Pottery Museum and perhaps longer term it will be displayed somewhere.

What did Project Potterbot provide to schools?

Each school received one class box of resources, plus fifteen individual kits so any disadvantaged children who were isolating could have access to the materials and engaged in the same task via Zoom. The written materials are all live on the website as downloadable resources.

We created a **collective classroom** with schools across the City engaging in this big project. It’s just brought everybody together. Just seeing the children’s faces creating something out of scrap has been amazing. Adding the motor turned it into something that can move as well.

We’ve got a Science Influencers’ Whats App group where brilliant pictures were posted along with some great feedback. We also asked schools to Tweet and post pictures of the children’s work #Potterbotornot, so that we could get it trending.

This sounds like an amazing success; how do you ensure it continues?

Being back in school has been demanding for some teachers and they chose not to take part in Science Week, but they are planning to create Potterbots for the Great Science Share for Schools (GSSfS). The good news is they can still add to the online mosaic that will to stay live until June. In our school children in other year groups can also create Potterbots during the GSSfS. The Potterbot task can lead to a CREST accreditation. So, hopefully schools will take it further and children will be able to work towards a CREST award.

And what difference has Project Potterbot made to you?

Who knew I was capable of creating something like this; being part of something so big? Teachers in my school and beyond have come to me with questions about the project so I’m becoming recognised across the City. There was an article in the Stoke Sentinel and even in the Guardian. I have also written a Blog for the Royal Society website.

It’s wonderful to know that I’ve had an impact and that people are genuinely interested in what I created.

*https://stemday.co.uk/potterbotlive/

"Be part of something bigger"

In conversation with Becki Price – A Science Across the City Science Influencer

At the Association for Science Education Becki told a very personal story to a fascinated audience of primary science educators.

A few years ago, I was given the role of Science subject Leader and my first task, or, the only one I knew I could do, was to sort the cupboard. There were no instructions for becoming a Science Leader, other than googling 'what should a Science Leader do?' I was a lone Science woman in a community of other subject leaders, but they all had their own agendas. I was part of a fabulous community in school who were happy for me to 'do whatever I wanted with Science'…but I didn't know what I wanted to do…I didn't know what I didn't know. I didn't know what was possible. The lid needed lifting for me.

Early on in my Science Leader journey, I received an email about becoming a part of a local network cluster for Science. I remember rolling my eyes, moaning about having to attend and the 'work that came with it'. Looking back, I recognise that those small networks and little nudges, were a significant part of my journey as a Science Leader, but also as a teaching professional. I was encouraged and nurtured. I had a place to put the world of Science Leadership to rights and for people to appreciate me and understand my frustrations. At the time, I don't think I quite realised all this enough to appreciate it, but I kept going because I came away with great science CPD for my school.

I had quite a major accident, broke my leg and was out of action for around 6 months, but on returning to the network meetings I remember being presented with flowers. I was taken aback and thought, how do they know? Do I matter that much to this group? Is this what a professional community is like?

This point was an absolute shift in my thinking.

I wasn't a lone Science Leader anymore; I was part of something bigger. My eyes had been opened to a community of fellow leaders who all had similar headaches and successes to me.

Over a number of years, I have become a part of a bigger Science family. This journey involved being nurtured, valued, praised, challenged and introduced to a wider world that can make a big difference to a lone Science Lead. We've shared ideas so no one's workload is too high, and no wheel reinvented.

I was still a lone Science Leader in my school, but I've been doing the role, better, deeper, with more impact.

Daniel Pink, a best-selling US author, claims that it is innate human behaviour to want to be part of something bigger and when we are, we thrive

STORIES OF SUCCESS: IN CONVERSATION WITH BECKI PRICE – A SCIENCE ACROSS THE CITY SCIENCE INFLUENCER

Communities of practitioners. Which Science groups are you a part of?

So what has been the impact of Science Across the City in your school?

As a Science Leader I think I have gone very much from a tick list to that deeper understanding. I've gone from tick list to 'so what?' What are we doing and why? What is important? Leading to a deeper understanding of what Science is and why it is that way. We are definitely not perfect. I'm not a perfect Science teacher and I know other staff would say the same, but I think we've got that deeper knowledge of why we want things to be the way they are and what's important and not so important.

So what do you do next?

I am now a Science Influencer and work more within the science community influencing practice in local schools. Before I was more internal and focused on my own setting. It has opened my eyes to all the opportunities and organisations that I didn't know existed. Now I work closely with my own cluster of four schools and we've spent the autumn term building professional relationships. I am here to help, not be a hindrance and through that relationship now they are participating more.

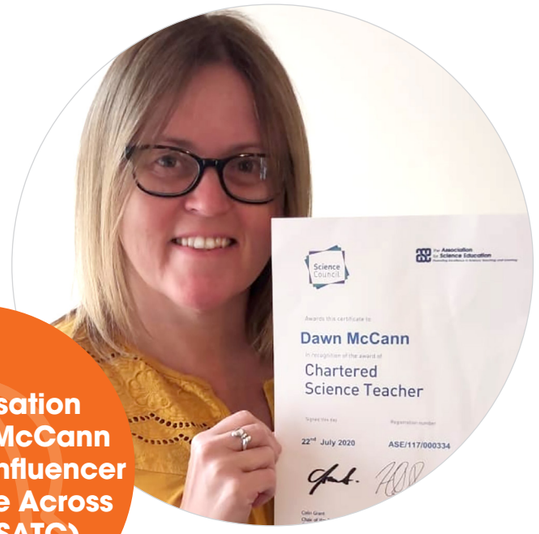
So what has been the most important part of Science Across the City for you?

You can only learn so much if you stay in your little bubble. There has to be an opportunity to come out of that bubble and join a like-minded network support bubble. I didn't know it existed. I needed someone to say let's take you out of your bubble and find you a new bubble. Being part of an external community gives worth to what you are trying to do, and it challenges you to do it better. It makes you feel useful and validated and you're motivated to go above and beyond.

I've now been exposed to the world of primary Science and all the various elements that come with that; the pedagogical understanding and the ideas and resources. The possibilities are endless. I think it was part of the small cluster project that facilitated all of that, which, in turn, improves the quality of Science teaching and learning.

Definitely being more involved in the landscape of STEM and now that I have got the knowledge of what's available, I can then go and influence other local schools.

"How can I make it even better?"



In conversation with Dawn McCann - A Science Influencer with Science Across the City (SATC)

Tell me about becoming a Science Influencer

In 2019 I was nominated by my headteacher to become a Science Influencer. I didn't feel overly confident and took some convincing, but agreed to join the team. Starting with a buddy, we went into two local schools to support them. It's just grown. I've now been promoted to the more formal role of Coach and have several days allocated to support schools. We reflected on their targets for development and are now working through tailored support to improve science. This time it has been easier to go it alone because I know that I am further along in my science journey and I can help them improve science teaching and the life chances of their children.

Being part of the Science Across the City network is clearly important to you

Before I've always been isolated as science leader but I found this little hub of super science people who had got their teeth into so many science things and it was all new to me. Now it's like a sense of belonging with the like-minded SATC community. It's being in the loop with other science leaders and you'really on the same page – your confidence just grows. We share information, resources, ideas and suggestions. We have our Whats App group to ask questions and bounce ideas around, so there's quite a buzz all through the year. You just get better and better as you work with them. You constantly strive to improve.

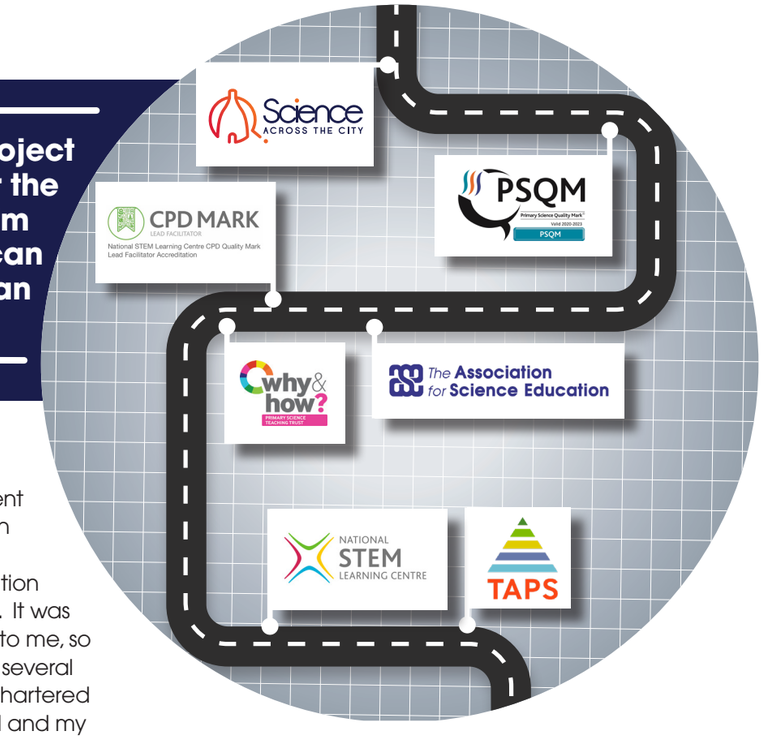
What opportunities opened up for you when you became part of SATC?

There have been so many great opportunities. The Digging Deeper days broadened my knowledge of the organisations out there who support and promote primary science. Science Learning Partnership facilitator training helped me build skills in the delivery of science training. This made me realise I do have the ability and skills to disseminate information to others. I received Teacher Assessment in Primary Science (TAPS) training then became a TAPS champion supporting two local schools.

"While policy rhetoric stresses knowledge and technique as central to good teaching, I draw attention to the importance of purpose, passion and desire."

Hargreaves (1995:9) Development and Desire: A Postmodern Perspective.

Being part of this SATC project has taken my passion for the subject to a new high. I'm always looking at 'What can come next?', and 'How can I make it even better?'



Also I've written some TAPS focused assessment tasks and one has already been published on the TAPS website.I have presented at Teach Meets in person, and virtually at the Association for Science Education national conference. It was quite scary at first, but as everyone listened to me, so it was not so bad! Last summer I was one of several Science Influencers awarded CSciTeach (Chartered Science Teacher). Clearly the group helped and my involvement with SATC supported my application massively.

I am currently looking at the links between science and reading through the Better Reading-Better Science training and am also very a passionate about developing STEM, particularly good maths and computing links with science - my next venture!

Tell me about sharing your passion for science

I used to think that everyone knew more than me. It's only little old me. I was a fidgety hands-on learner and I'd get bored sat in class. However, I always had a passion for science, but not until now have I felt in a position to share this passion with others, in the way that SATC has prepared me for and is allowing me to! Being part of this SATC project has taken my passion for the subject to a new high. I'm always looking at 'What can come next?', and 'How can I make it even better?'

Final Thoughts?

I don't do it for myself. I do it because I love it and it has such an impact on the children. I don't understand why people don't like science. Science is the best subject in the world for children.

"I often state that success breeds success, but for this to be effective first we have to identify the success that should be celebrated. Dawn is a wonderful example of a Science across the City success, but the most modest subject leader you could ever meet. Her knowledge of the science landscape is extensive and her energy to share ideas and connections with others is boundless. She is an inspiration and positively influences science education practice in her school, within the Science Influencers network, and with the teachers she coaches."

Tina Whittaker,
Co-lead to Science across the City.

Collaborative STEM Stakeholders in the City

Science Across the City

TAPS

Royal Society of Chemistry

why & how? Primary Science Teaching Trust

North Midlands Science Learning Partnership

National STEM Learning Centre

The Royal Society

The Ogden Trust — making physics matter

PSQM Primary Science Quality Mark

Manchester 1824 — The University of Manchester

Practical Action

Great Science Share for Schools

.uk esero

The Curiosity Box

Keele University

Space Camp — Do you have what it takes?

Thinking Doing Talking Science

Binding Blocks — Building the Universe one nucleus at a time

My Everyday Science

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