

Primary Science

Special Issue:
The Great Science
Share for Schools
January 2021



The Association
for Science Education

The ASE's journal for primary science

Special Issue: **#GSSfs**

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Primary Science Special issue

Editor Dr Leigh Hoath
Guest Editor Dr Lynne Bianchi

Great Science Share for Schools Special Issue

I have had the pleasure of being involved with the Great Science Share for Schools since 2017 and recognise the value of its growth each year. With each new launch, more and more schools and individuals become involved. 2020 was an exceptional year – for many reasons! The GSSfS was forced to respond and adapt, like many others, in order to survive. What we introduce in this special issue are some of those adaptations and how the GSSfS maintained its success despite the challenges.

There are also journeys within this issue, which highlight the commitment to the GSSfS over the years from individual teachers to the world's largest chemical company – and a lot in between! The GSSfS not only provides a hook for learners to be further engaged with science but, more importantly, is underpinned by sound educational foundations. It is not about a 'wow' – it is about so much more. It inspires, it promotes science and it moves those involved from engaged to invested... we see learners bothered about what they are doing.

Read these accounts and, if you are already involved, consider how you can support others in taking part. If this is new to you, then have the confidence to take that step and be part of the 2021 GSSfS!

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The Association For Science Education is a family of teachers, trainees, technicians, consultants and academics united by a common goal: promoting excellence in science education.



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The Great Science Share for Schools (GSSfs)

Welcome to this special issue!

Great
Science
Share
for SCHOOLS

Grabbing anyone's attention to do something new is never easy, yet with this campaign, it is.

Read support has been gained by so many teachers and STEM organisations, and families too!

Each and every one of us has a vision and passion for children's science learning. Whether

Attainment or aspiration, there is always one shared mission in our minds:

That children experience the *best* we can offer.

Spotlighting primary science, raising awareness and value in schools is a core outcome.

Competition is out, and collaboration is in... this inclusive campaign seeks to encourage and

Inspire children's scientific curiosity, by securing time within our busy curriculum to **E**xperience asking, investigating and sharing children's scientific questions and enquiry with

New audiences. It's liberating to give children the voice so that they become the science

Communicators for our future. Involvement of so many STEM organisations allows **E**ach and every one of us to raise the profile of primary science. Live lessons, Twitter chats,

Scientist profiles, themed resources and a vibrant community offer the know-

How to support young people to develop confidence, agency and enthusiasm to talk

About their scientific questions and observe more closely the world around them.

Ready to be a GSSfs ambassador or sponsor? Join in and take on a role that best suits you.

Engage and improve the campaign with us, and let's make each year greater than the last!

**Dr. Lynne Bianchi, SEERIH
Director, The
University of
Manchester,
explains
the vision
behind the
Great Science
Share for
Schools (GSSfs)**



GSSfs is a timely campaign to engage whole school communities in raising the profile and engagement of young people in primary and secondary school science. With the status of school science lower than that of other core subjects, the campaign has been shown to lead to more time for science learning in school and at home, so that young people can ask, investigate and communicate *their own* scientific questions with new audiences. GSSfs stands apart by valuing children's scientific curiosity and communication – placing it front and centre of this fast-growing campaign.

Launched by The University of Manchester, as part of the European City of Science in 2016, the campaign has continued to grow in size, importance and overall impact at a national level. Extension beyond the UK is welcomed and we work to be open and inclusive to as many collaborations as possible.

The ambition now is to be attentive to improving **ENGAGEMENT** and **QUALITY** of experience for 3-14 year-olds. We welcome groups and organisations that can offer support, however small, in driving towards these two goals.

If you wish to support the campaign, contact us at greatscishare@manchester.ac.uk
We'd be happy to talk with you.

GSSfS and the world around us!

Neil McAllister reflects on the power of a whole school community approach to science sharing

Fairview Primary School was my own primary school, although I don't remember doing too much science back then. When I moved to my post-primary school, science was not a subject I particularly enjoyed but I achieved a Double Award Science at GCSE with a C grade. In essence, that was my last experience of science before I became a teacher. Why the life story?... I hear you ask.

I wanted to provide a context for my journey to becoming the science leader in school – or 'The World Around Us Leader', as we know it in the Northern Ireland (NI) Curriculum. For us, science is not a core subject and falls into a cross-curricular learning area with History and Geography.

Science within a Northern Ireland school

My early years of teaching 10-11 year-olds saw a very prescribed approach to science, driven by what needed to be covered as part of the statutory 11+ Transfer Test. Experiments were teacher-led and left little room for children to investigate or follow up on their own questions. But at least science was happening. With the revised curriculum in NI, launched in 2000, science dropped off the curriculum and became virtually non-existent in many schools. If we are honest, Fairview was one of these schools, and that



included my classroom too.

It was the support of a schoolteacher mentor that inspired me to bring science back to life by exploring how it could be the catalyst for great work in literacy and numeracy. She was an experienced teacher and drew on her knowledge of a topic-based approach to curriculum design. She was a role model and I felt empowered, suddenly seeing how science could be central to my work as an effective teacher. And so my journey began.

● A few key things happened from there: I engaged in a number of CPD

courses, affiliated to the National Science Learning Centre, to develop science in my own classroom and year group;

● I took on the role of 'The World Around Us Leader' in school and continued to seek out CPD opportunities that encouraged my colleagues too! and

● I achieved a Primary Science Teaching Trust (PSTT) Award, which opened the door to a local cluster of teachers and schools, essentially laying the foundation for my vision of science in Fairview.



With PSTT support, I set up a cluster of five local primary schools in Ballyclare, through which staff from all the schools met a couple of times a term to share ideas and resources for science and to develop further resources. I sought to involve as many staff as possible from my own school, covering all age phases to empower them to also integrate science throughout the school.

a school, were about. Having got science happening again in school, we wanted to embed it in every classroom, make it exciting, make it investigative, make it answer the pupils' questions.

Engaging with the Great Science Share for Schools (GSSfS) in 2017 gave us a chance to showcase best practice. Teachers share ideas, but don't always see the outcomes. Most classes took part in the GSSfS and every class came to visit the hall and see what was being shared. Pupils were talking to teachers from other classes and year groups and telling them about their science. The following year, we introduced Trusted Colleague Network (TCN) into school, where teachers got to visit other classrooms and see colleagues teaching a lesson. Through this, staff were able to see high quality science lessons, and not just hear about them.

Our 2018 GSSfS saw almost every class involved and children sharing their science. In fact, we had to run two sessions to accommodate it, with other cluster schools, parents and friends also invited.

What made the difference at Fairview?

The difference from our first year was confidence. Pupils and staff talked with more insight and pride about how questions were generated in class and how they collaboratively went about investigating. The child-led approach was much stronger.

As Subject Leader, I was able to give more time to visiting classrooms and supporting staff to move from just 'doing' science to planning for high quality outcomes. We began to focus on science skills and I worked with my team to map a progression of science skills through school. We linked our science skills with the statutory comments in the NI Curriculum for 'The World Around Us' and placed the Great Science Share as a core event in our school calendar.

The support of my principal was also crucial – it enabled me to get into classrooms, and seeing science lessons happening was vital in getting a clear picture of what was going on. Staff valued the support – being keen to step up their science yet not always sure how. A visit, a chat and feedback, sharing some ideas and also enabling staff to see their colleagues through the Trusted Colleague Network (TCN) have made such a difference to the quality of learning and teaching in science at Fairview.

The improvement and impact from the first to the second Great Science Share was incredible. From just showing science in the first attempt, to having children working from a key question in which they were interested by the second year was the shift that it needed. From reluctance from some teachers to take part to a desire to showcase various examples of classroom practice in the second year showed to me how far the staff have come, and how quickly.

Factors that I think made a big difference were:

● The thematic approach to science, where every year group developed science opportunities that linked with a theme. This led to science becoming meaningful and also provided opportunities for developing literacy, numeracy and ICT. Science was not an add-on!

● As subject leader, I met with most year groups over the year, pointing them towards resources to increase engagement in science enquiry and questioning: for example, Explorify's 'The Big Question' has been an important scaffolding tool for teachers beginning to think about building science around a question; the Council for Curriculum, Examinations & Assessment has produced two outstanding resources, 'Earth Science' and 'Growing for the Future', as well as a number of STEM Thematic Units that link directly to many of our current KS2 topics (<https://ceea.org.uk/learning-resources/stem-thematic-units>); PSTT resources, 'I Can Explain', 'Titanic Science' and 'Science in my Pocket' are excellent, and the range of resources made available during lockdown have been outstanding ('Science for One', 'Science Fun at Home'); and, finally, the Royal Society of Chemistry education



Science takes centre stage

Placing 'The World Around Us' as a key focus in our School Development Plan led to me working to achieve a Primary Science Quality Mark (PSQM) Gold Award (as it was then). This PSQM journey was another game-changer. It required full buy-in from the whole staff but, with so much groundwork already in place, this was an easy sell. Suddenly, science was at the forefront of what we, as

Keywords: Cross-curricular ■ Science enquiry ■ Whole school approach

website (<https://edu.rsc.org/>) has brilliant ideas for developing topics with all manner of science.

- PSTT Fellow and Regional Mentor, Lesley Hunter, has produced four books entitled 'Here's My Topic, Where's My Science', a perfect starting point for all our topics in school, from P1 to P7 (ages 4-11).

- Engaging with social media forms, in particular on Twitter, where there is a tremendous source of ideas and inspiration from stars like @SciencesSparks, @whizzpopbangmag, @Glasgow, @DrJoScience, to name a few!

- Building a central bank of practical resources in school, to which staff had open access.

- The introduction of a new assessment structure using Teacher Assessment in Primary Science (TAPS, Bath Spa University), where science skills were put at the forefront of their investigations. This gave staff, and indeed pupils, a clearer focus to their work and, when pupils talked about their science, they knew what skill they were developing. They were familiar with the language.

It needs to be noted that the impact of the TAPS methodology on Fairview's science journey cannot be underestimated. The cornerstone of TAPS is the development of science skills and staff have been empowered to take ownership of this. Now, when pupils are engaged in science lessons in Fairview, they are aware of the skill they are developing, skills directly linked to the Northern Ireland Curriculum and the *Science and Technology: Progression Guidance* document. Equally as important has been the contribution of staff to creating TAPS tasks. As well as the bank of tasks on the TAPS website, we have a number of our own tasks in Fairview that year groups have developed (and which may eventually make it to the TAPS website as well).

Continuing to make the science great!

The 2019 Great Science Share in Year 3 (ages 6-7) was huge. Staff and



and appropriately challenging learning opportunities that matched the individual needs of the children'.

It has been very noticeable how pupils showcasing at the Great Science Share have a specific question that they are investigating and a clear idea of the skill they are developing. It sounds simple, but it is evidence of huge strides being taken in the right direction!

With pupils empowered to investigate, we now have teachers empowered to facilitate this new type of learning.

This was highlighted in our recent ETI inspection 2019: *'The highly effective links between the school and the natural and man-made environment connect, enrich and extend the children's learning'*.

This year (2019/20) has been a strange one in school due to COVID-19, with such a huge chunk cut off the end. The Great Science Share 2020 was very different, as everything happened at home, but this was potentially the best year yet! Just under 75% of our pupils contributed to the Great Science Share, either through posting on Twitter or sending to their teacher on SeeSaw. Every staff member made it a priority to stimulate pupils and get them investigating. Staff have spent time sourcing ideas for science and, with pupils being out of class, there has been time to do this. That in itself has been a lesson.

We have come a long way with science in Fairview, with a gradual empowerment of pupils and staff. The Great Science Share has given the whole school community an opportunity to showcase that improvement each year. We are looking forward to the next step and to 2021!

Neil McAllister is the Deputy Headteacher of Fairview Primary School (Northern Ireland).

Website: <https://www.fairviewps.co.uk/>

pupils talked about it all year – what they would share, can they have more than one table to share their science? Other cluster schools again took part. Parents, grandparents, STEM Ambassadors, political representatives, school inspectors and post-primary teachers all got involved. Every class took part. Moving from not doing science at all, to doing science but with no real purpose other than fun or to complete a worksheet, to currently purposeful investigative science, built around questions generated by the pupils through inspiring teaching, focused on a progression of science skills through school.

The GSSfs has enabled staff to see pupils in action from other classes and year groups, build on best practice, generate ideas and excitement and showcase all that is good about science in our school. The TAPS tasks, which are often the basis for the science shared at the Great Science Share, are enabling staff to be empowered to enrich the learning and teaching in their own class and year group through science. In our recent school inspection, it was reported that *'...the learning and teaching were characterised by: interactive, investigative learning experiences; open-ended questions;*

Cooking up a storm

With a kitchen for a classroom, Gemma Davis explains how child-centred learning has uncovered a love of science



A close look at the world

I looked across the kitchen table at my 5 year-old little girl, Marthy – lab coat on, sleeves rolled up, hair and face splattered in flour, chatting away to herself as she went into 'sci comm presenter' mode. This is now a familiar sight, but amazing to see nonetheless; with her head cocked to the side and an inquisitive eyebrow raised in anticipation...she let the stone drop. An explosion of flour rained down on her (and the kitchen floor) as she squealed in delight and shouted 'Again, again!' This has become a standard day in our house since we signed up to the Great Science Share for Schools (GSSfs).

Unprecedented times – the 2020 lockdown

By the time the Great Science Share for Schools launched its adapted 2020 strategy, with weekly themes to inspire questions, we had become accustomed to being in lockdown as a result of the COVID-19 pandemic. As a family of mum, dad and daughter, we had set a home-learning timetable and had got into a rhythm of daily activities. What we noticed, however, was that teaching discrete subjects separately, without an overarching theme, resulted in what felt like very disjointed and hollow learning.

We were inspired by the GSSfs themes that were linked to different topic dates in the calendar, such as World Ocean Day and International Dawn Chorus Day. This helped us, as parents, to bring together concepts

Celebrating the Royal Astronomical Society's Birthday Week!



and skills from different subject areas under a single theme or topic appropriate to inspire a 5 year-old, and this approach made planning a whole lot easier and helped Marthy to make the fullest sense of the world around her.

I found that our participation in the GSSfs gave us the opportunity to refocus learning through a child-centred approach, harnessing Marthy's natural curiosity in science. She is young in her age group and enjoys discovery, wonder and exploration – all things that Marthy is more than capable of doing naturally through play, mirroring the project-based pedagogy of early years learning.

Science capital – #AskAQuestion

'Our research found that the more science capital a young person has, the more likely they are to aspire to continue with science post-16 and the more likely they are to have a "science identity", for example to see themselves, and to be recognised by others, as being a "science person"'

(Archer, 2018, p.6).

One of the most joyous moments that I witnessed happened whilst filming my daughter talking about Astronomy Week. After discussing the topic of the day, she turned and said 'I know science now!' Obviously, Marthy doesn't have all the answers and has a great deal of science knowledge to gain, but this comment served to demonstrate how gifting her the freedom to shape her own learning experience had boosted her self-esteem and confidence.

Keywords: Family learning ■ Home learning ■ Parental engagement ■ Science capital



More questions with the GSSfs Question Teller

We've read about science capital and have seen how it is not fixed and that, through our work together, this can be further developed. Participation in the GSSfs enabled my child to release her inquisitiveness; asking 'Why?' moved onto asking 'What if...?', 'How does...?' and 'I wonder why...?' as her awareness of the world broadened and she sought a greater understanding.

Each week, we printed off the GSSfs Question Makers, with Question Spinners, Question Hands, Question Frames and Question Tellers helping to stimulate questions. They were really accessible and helped to shape Marthy's natural inquisitiveness for asking questions into asking great scientific questions. As a parent, they gave me a tangible resource that focused on the asking rather than jumping straight into the doing.

Beyond the worksheet to making strong learning connections

The GSSfs provided the opportunity to move away from countless worksheets and online lessons. We explored and investigated the weekly themes through a variety of methods, including using technology, creating films, conducting experiments, observations, monitoring, reading, baking, drawing, making, researching and writing.

Mornings were mainly literacy- and maths-focused, but I made sure that the tasks were connected to the week's theme, even if it just meant using a space person writing template or a spaceship number line. This linking together of everything we did during the week allowed for a much deeper level



A myriad of learning, inspired through Marthy's questions

of learning and I began to notice the connections that Marthy was making between the different things she was learning.

Marthy began to talk about her learning over lunch and then at the tea table, and most nights I would say goodnight to her as she reeled off what she remembered from the day. Another highlight was the day that we were learning about the effect of global warming on ice caps. She was thoroughly immersed in measuring the water as the ice melted and giggling as the little sea creatures fell into the blue tinted water in our front garden. I looked over at her and she had a concerned look on her face: 'Mamma, if the ice melts, will Emperor penguins be able to keep the eggs warm like Steve did?'

We were now in Environment Week, but we had learned about Emperor penguins already. We read books about penguins, labelled drawings, conducted experiments looking at how they glide, how they eat and how they keep warm, we took part in a live chat with a penguin expert, played Penguin Prey maths games outside on the pavement and watched a film about 'Steve', the Emperor penguin. My little girl is in Year 1 (age 6) and naturally I ask her each day after school, 'What did you learn today?'. It is often met with 'don't know' or 'can't remember', but not only was she able to remember so much knowledge about penguins, she was able to recall and apply that knowledge to a real life crisis and ask a scientific question about it. I was rather taken aback by this level of understanding, truth be told.

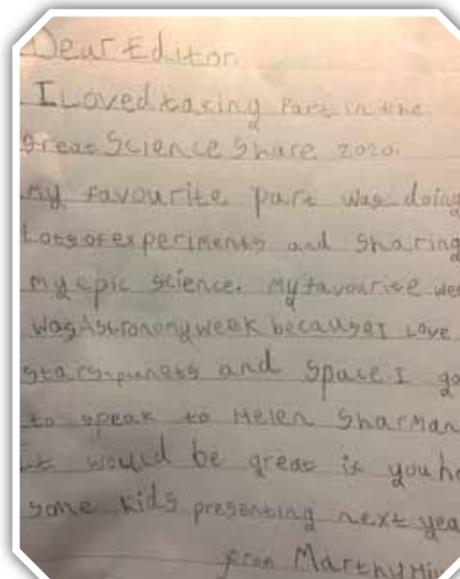


Solar oven inspired by GSSfs Wonder Wednesday's live lessons with @DrChips

She was demonstrating awareness and connection, and without connection there is no interest, and interest always precedes authentic learning.

A sense of community – learning from each other and shared learning

#Ask AQuestion enabled us to seek answers in real time from real scientists, so even though we were in lockdown and socially distant from our community, we were able to feel part of the GSSfs community. Marthy loved sharing her learning in a variety of forms. It was a non-competitive and inclusive environment, as the emphasis was placed on asking questions, sharing knowledge and collaborative learning. She felt encouraged to communicate her scientific questions and investigations with new



Marthy's reflections on GSSfs 2020

audiences. This accorded Marthy much enthusiasm and confidence to share her findings, knowing that the other participants were interested. For the most part, I was learning alongside her – the community felt like a safe place to take risks, to ask questions, to get things wrong and to not worry about winning or losing.

Where next for family science?

If it wasn't for the lockdown, we would not have had the chance to take part in the GSSfs 2020 as fully as we did. As Marthy shared her science with others, she became even more determined to experiment and, as I started to record and share the experiments, her confidence grew and she would come to me to ask when she could film another experiment.

The GSSfs was the catalyst for a newly acquired love of all things science. When asked what she enjoyed most about the GSSfs, she replied 'everything, I loved everything. I had so much fun'. I am surprised by how much knowledge she has gained in such a short period of time. Marthy has started to recognise science in the world around her, making connections, linking topics and dilemmas, asking relevant scientific questions and using scientific language.

We were browsing through some cookie cutters on the Internet the other day and she casually stated: 'Look, Mamma, a DNA cookie cutter!' – and she was right! I hadn't even noticed. Science has become a part of her everyday life. Sometimes I witness her role-playing with her dolls as Freyja the Forensic Scientist; at bedtime I listen

outside her bedroom door as she chants out the correct order of the solar system (including Pluto as a dwarf planet); other days I will open her bedroom door to see her bird watching, engineering a zipline out of Lego or drawing her science lab.

The GSSfs 2020 has inspired a future scientist but, until then, we will be back next year sharing our science, asking questions and, most importantly, having fun with science as a family!

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Gemma Davis is Mummy to her daughter Marthy and a secondary trained teacher with a passion for increasing the science capital of all ages through engaging STEAM activities. Follow them @EdadventuresM#MarvellousMarthy

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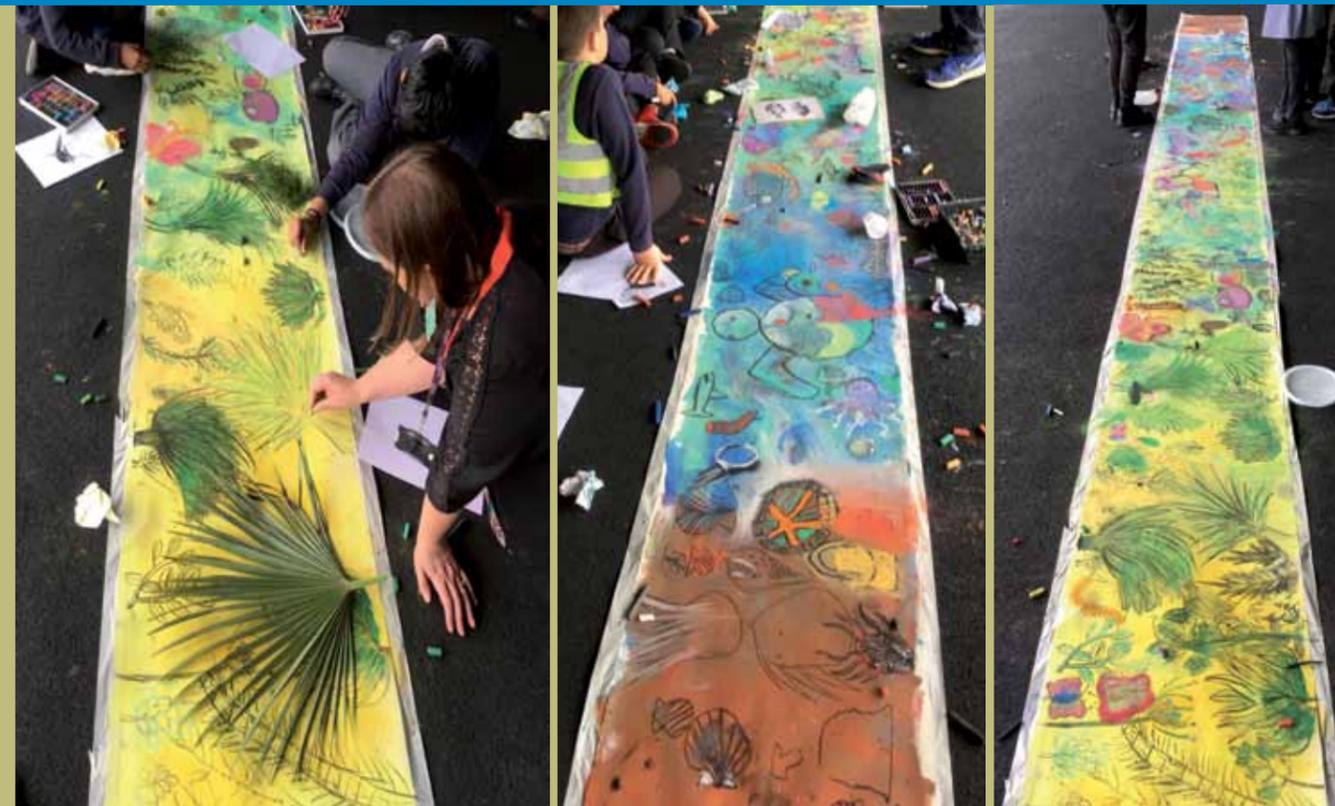
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Homemade harmonica

“But what if the schools don't come?”

Liz Lawrence and Kulvinder Johal reflect on bringing scientists and artists together to collaborate and share as part of the GSSfS campaign



Artwork in progress: Life on land

Artwork in progress: Oceans and the Dead Zone

Artwork completed

We were putting together our plans for the first London Borough of Barking and Dagenham Science Share in 2018. What became an exciting and innovative element of our Great Science Shares had a rather inauspicious beginning as a contingency plan.

After some tense moments trying to find a venue in a borough where space is at a premium, we had found a conveniently located primary school that was happy to host. As a Primary Science Quality Mark (PSQM) school, Gascoigne Primary takes its science seriously and, in the process of expanding into a second building, it had a corridor of new classrooms that were not yet occupied by classes. We booked them for the full day, sent out information to all borough primary schools and were planning our sharing schedule.

Four or five schools had assured us that they wanted a table but, even with a closing celebration in the hall, we were not sure we could sustain the sharing for the whole day with so few projects. We decided that we

needed a plan to fill any potential gaps in the schedule and make the event sound even more exciting to the schools that were wavering. What we needed were some special guests and something a bit different!

Linking to the Arts

Barking and Dagenham has a long history of good practice and collaboration with prestigious partners in the creative Arts. For many years, Liz had worked with local artist and art teacher Jim Scott, and dance teacher Bobbie Gargrave, on creative projects and courses linking science, design & technology, art and dance. Bringing some of that practice into the GSSfS to enrich the science experience and showcase creative links seemed a logical next step.

Jim Scott was commissioned to work with all children taking part in the GSSfS event, making a giant artwork inspired by some of the enquiry questions. Science was at the heart of it, with habitat-focused questions including 'What are the different life cycles in the layers of the Amazon rainforest?' Two separate schools also considered the

problems and possible solutions to plastic pollution, exploring the threat to our natural world from pollution.

While Liz was linking with Jim, Kulvinder was drawing on the contacts that she had made as a science subject leader. Her strong focus on enriching science was enhanced by her role as a Primary Science Teaching Trust Fellow. She invited Dr. Helen Mason, Reader in Solar Physics at Cambridge University, whose leadership of SunSpaceArt made her the perfect special guest for an art-linked GSSfS, to the event. Widening our natural environment theme, she also invited Dr. John Richard Dudeney OBE, Former Deputy Director of the British Antarctic Survey, and Charlotte Pike from Geobus.

Outcome and impact 2018

On the day, Helen and John hosted a very popular table, with art and science activities linked to space and the question, 'What invisible light comes from the sun?' John shared insights about his trips to Antarctica, including stunning images in books and on screen, as well as a set of his

explorer's clothing and kit.

At the Geobus table, children were able to examine a range of geological samples and ask lots of questions. They were thrilled to meet real scientists, ask questions, share their own projects and make links between those scientists' work, some of their own enquiry questions, other work they had done in school and the artwork they were creating.

As well as having time to share their own work and explore the other sharing tables, children were timetabled in groups to visit Jim the artist and add their contribution to the giant artwork. Created on a huge roll of paper, this was built up on a background shaded from the yellows and greens of healthy land habitats, through to the blues of the ocean, to the brown of a dead and polluted future.

Stimulated by images, leaves and rubbish provided by Jim, their own and others' work for the Science Share and the images from Antarctica, each group used pastels, charcoal and chalks to add layers of living things and manufactured detritus to create a continuum from vibrant life to almost lifeless.

The finished artwork was displayed on the hall floor at the end of the day for everyone to walk around and admire. Teachers reported that children found such a strong visual representation of a familiar and current issue very powerful, generating discussion back at school and an increased interest in linking science and art.

And we needn't have worried – on the day, we had 9 schools bringing around 70 children from age 7-11 (Years 3-6) occupying 14 tables of questions and activities.

GSSfS 2019 – the musical one!

In 2019 we were once again lucky enough to secure a corridor of empty classrooms, this time in the still expanding primary department of Eastbrook School (an all-through school in Dagenham). This enabled us to invite another scientist and to create a separate creative Arts space within our Science Share to continue the theme. Taking inspiration from the Great Science Groove, Kulvinder invited a former colleague from Northbury Primary, music specialist Danielle Wakefield, and the school kindly gave permission for her to join us

for the day. We also invited Robert Ratford, a locally based former secondary science teacher now doing science outreach, to share his passion for microscopy with a long table of different microscopes and specimens.

Word had got around and we expanded to more than 120 children, this time including some 6-7 year-olds (Year 2), from 13 schools, with 21 scientific questions. There were also some excellent marshals and helpers from among the older pupils in the host primary (fantastic organisation beforehand and on the day from Julia Cutri, our contact in the school) and all the Eastbrook primary pupils were able to visit at some point during the day to try out the activities.

During the day, once again visiting the creative Arts room in small groups for a collaborative project, children composed a song, drawing on the science that they were sharing, and rehearsed it. The performance at the end of the day, complete with instrumental accompaniment, was a triumph.

Keywords: Science and the Arts ■ Collaboration ■ Music ■ Scientific questions

Describing the experience in her own words, Danielle writes:

'I originally wrote the chorus for the song and had it spell out the word "science" using scientific terms that I had my selected Northbury students help me pen. I then decided to leave gaps in the verses to make it more interactive with the schools involved and decided they would each write a short verse to be "rapped" over the music.

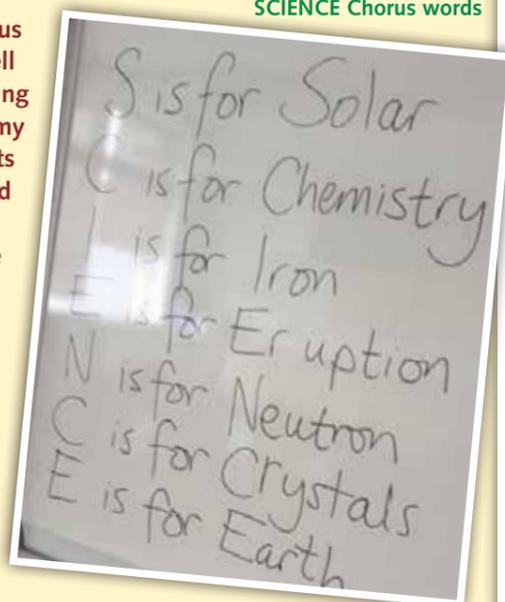
'This worked perfectly in terms of content, as all the schools seemed to be covering different areas so there was lots of diversity.

'I also wanted to merge the two subjects of science and music and decided to create some homemade instruments so there was opportunity to discuss the concept of pitch and how sound is created. I made harmonicas from lolly sticks, paper and rubber bands. There were pitched glasses of water, "chicken in a cup", which involved paper cups, string and wet tissue. For the finale, all the children got to let go of an inflated balloon, which created an ear-catching sound and also was visually interesting!

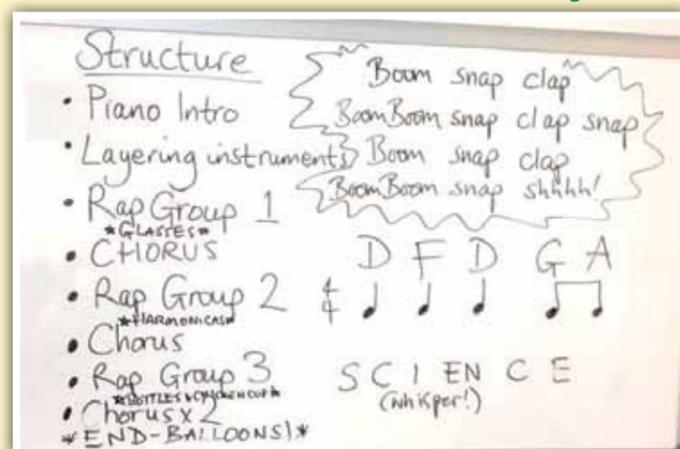
'I loved this project as it allowed for so much creativity, which is what music is about. It allowed children to be creative with it too, regardless of their musical ability. I think the students really engaged and enjoyed the idea of writing and performing their own rap; they also enjoyed experimenting with the "scientific instruments". It also helped to embed their scientific learning, as they were using their previously acquired knowledge to write their verses.

'It was just a lovely experience and so much fun! I would do it again any day!'

SCIENCE Chorus words



SCIENCE Song structure



Reflections

The comment boxes that we had in all the sharing rooms yielded lots of positive feedback from the children. Much of it was about how much they had enjoyed sharing their own enquiry, or focused on interesting things that they had learned from the other sharers, but several children also shared their enthusiasm for the musical link and the homemade instruments and teachers later reported that this was also widely commented on when reviewing the day back at school.

The main impact of the GSSfS will continue to be the opportunity for children to share *their own work* with a wider audience, building their own understanding of themselves as scientists and the science that they are learning. However, the additional exposure to 'real' scientists and the chance to explore science through the lens of the creative Arts have definitely brought an extra dimension to our Great Science Shares and something that we seek to maintain. Our big question is

Weblinks

SunSpaceArt:

<https://www.sunspaceart.org/> is a STFC-funded project led by Dr. Helen Mason OBE (University of Cambridge), which brings together scientists and visual artists to work with Key Stage 2 (upper primary) and Key Stage 3 (lower secondary) children on STEAM projects.

Geobus:

<https://www.geobus-london.org.uk/>

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Building bridges with the GSSfS

Angharad Pass and James Dunn explain how a collaboration on a virtual GSSfS encouraged authentic primary to secondary transition



Mr Dunn's Stomp Rocket Challenge

After hosting Great Science Shares in Leeds for two years, which welcomed 10 schools to Tranmere Park Primary School, we knew that the 2020 Great Science Share for Schools (GSSfS) was always going to be a new challenge. Our experience had been to work with our local cluster of schools to develop Great Science Share events that created meaningful links between primary and secondary schools in our area and supported the transition of pupils as they moved from primary school to high school.

Usually we would meet as the spring term started to discuss ideas and to begin our shared planning for the GSSfS. This year was just the same and two of the local high schools in the cluster were very keen to be involved. We had already started thinking about how the event, or possibly events, could be run. This was all before the COVID-19 virus hit and most schools shut down for everyone except key workers' and vulnerable children.

A changing world

Once we began settling into our new version of 'normal', we took up the baton of planning a GSSfS from where we left off. We realised that it wouldn't look like the previous years' events, which had been based on a 'marketplace' model where children had a table in the school hall with practical activities, posters and science books to share with their contemporaries. This

year was going to be different, very different.

We were determined to continue our cluster's shared focus on developing working scientifically vocabulary, which included building understanding of the assessment of risk during science practical activities and making links between junior (7-11 years) and lower secondary (11-14 years) science learning. We also felt strongly that the GSSfS theme of the Global Sustainability Development Goals (SDGs) was a really important message to be sharing with our pupils, so we began planning how the two could come together in a *virtual* environment – a completely new challenge!

Bridging the gap

From research done previously on 'bridging work' (Braund, 2016), it is clear that, with primary and secondary schools working together, the transition for students becomes smoother, with more continuity and logical progression. So, we set about planning a series of investigations, linked to the weekly themes of the Great Science Share 2020, which would engage the primary pupils, build on their prior experiences and incorporate some of the cluster's key focuses.

Each week, to support the GSSfS weekly themes, we published a guide for the pupils with key questions, weblinks and suggested resources to help support parents working with their

children, and to give them a focus and direction. Alongside these guides, James Dunn, Science Core Curriculum Lead at Guiseley School, filmed a series of practical demonstrations to be shared with the primary pupils. Linking with the weekly theme of the Royal Astronomical Society's (RAS) 200th birthday, he recorded a Stomp Rocket investigation and a Coke and Mentos fountain and, linked to the World Oceans Day theme, a diffusion in water experiment.

Alongside the weekly guides and videos, we decided that a variety of resources to support the learning would be beneficial. With some pupils learning at home and some in school, it needed to be adaptable and to use resources that were simple to access, such as household plastics, 'kitchen sink' items like food colouring, and with a variety of methods to suit the families planning home learning. For the Stomp Rocket investigation, we included the video, a template and the opportunity to record results, analyse data and try it at home, with instructions on how to make your own Stomp Rocket using easily accessible and recycled items. We included 'Challenge' ideas to extend the learning, including a follow-up activity using Skittles to support the learning in the diffusion investigation and links to websites including ScienceSparks (see cited resources below) to support both pupils and parents.

In the videos, there was a strong focus on key scientific vocabulary identified

Keywords: Science enquiry ■ Transition ■ Collaboration ■ Science communication



Family teamwork – enjoying the Stomp Rocket Challenge

as important for pupils moving up to high school, such as independent and dependent variables, discussions on safety and risk and considerations in planning and evaluating investigations. These all continued to build on our work with the cluster of schools.

The response from the videos and supporting resources was unexpected. It showed really engaged children being supported by their families, enjoying science learning together. We received videos, photos, pieces of written work, and some children had extended their learning by developing their own models or planning and carrying out their own



Diffusion, inspired by Mr Dunn's video

investigations. We found that recorded demonstrations by someone with whom they had links, with additional supporting resources to help extend and inspire, was a really positive way to engage learners and they responded to it by sharing their learning back.

#AskAHighSchoolScienceTeacher

We also developed the hashtag, #AskAHighSchoolScienceTeacher and, alongside a free online questionnaire, used it in conjunction with our online learning platform to give pupils the opportunity to ask a teacher from the high school a question. This could be about anything, from what learning

science was like when you moved up from primary, to any perplexing scientific question to which they wanted to know the answer. The opportunity to ask questions, and to get a response, helped pupils to feel more comfortable with the idea of moving to high school and build rapport and dialogue with the local high school teachers, and provided the opportunity to take part in a fun, shared event. The questions received ranged from those about the practical work you did at high school, to complex (for primary school) scientific phenomena and even more existential questions linked to evolution and the Big Bang!

Education for sustainability

With sustainability and the SDGs as a focus, we shared many fantastic resources with the pupils, including Practical Action Schools STEM Challenges and TEEd Earth School, and we used EncounterEdu to give further 'real-life' perspectives on many of the global issues. The science learning that was achieved by the children was often carefully considered, thinking about real-world problems and using sustainability to investigate and create. There were examples of children exploring the impact of climate change on the oceans, and also recycling and reusing to create bird feeders and other garden objects as part of the Dawn Chorus weekly theme.

Having more focus on sustainability during the GSSfs has prompted an audit on our current curriculum and how we can make sure that the SDGs have a stronger focus to ensure that our pupils have a good understanding of the problems faced by much of the world, particularly the Global South. This is something that we are embracing, as we feel that this is an important part of becoming an active global citizen for our pupils. Although the National Curriculum for England doesn't have a strong focus on education for



Considering real-life issues – recycled planters



#AskAHighSchoolScienceTeacher questions from the children

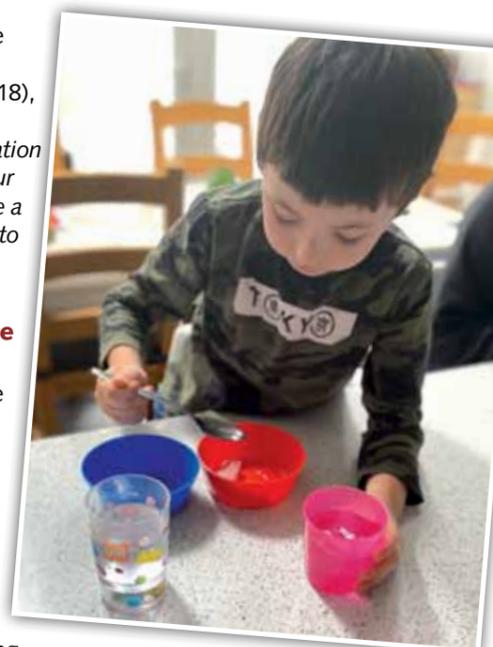
sustainability, as discussed in Science Education and the UN Sustainable Development Goals (Lengthorn, 2018), 'That's not to say that we cannot or should not find ways to build education for sustainable development into our classroom practice. Indeed, we have a responsibility to future generations to do so'.

We agree. We do!

The campaign day – 16th June 2020

With the pandemic still ongoing, we wanted to create more of a sense of school community, even though we couldn't be physically close, so we promoted and undertook investigations with our key worker groups and the returning year groups as well as sharing the resources and activities with our families learning from home. Creating rockets was a really popular activity, as was investigating craters, also linked to the RAS theme. We wanted to ensure parity between the home learners and children in school, give them an opportunity to share the learning that they were doing, wherever they were doing it, and this was a really positive way to do this.

We took part in the online lessons on the day, sending in questions to some of the live lessons, including those provided by Farmer Time and SEERC where the children enjoyed speaking to Farmer Tom and making O-gliders, as well as many of the other sessions.



Investigating the properties of ice during an online lesson

What did we learn?

- 1) We are adaptable – schools are in a great position to support their learners, whatever the context.
- 2) From the collaboration between primary and high school, we discovered that children continue to be enthusiastic and engaged with science, even when they are moving up to a new setting with different expectations, and that they can be the inspiration for teachers to reflect on their own practice.
- 3) Having key themes throughout the GSSfs both during the themed weeks and the key focuses, for the cluster, of transition, vocabulary progression and managing risk in investigations, gave the event cohesiveness. Everyone was working to the same end goal and it also helped to direct the scientific learning focus of the pupils.

We strengthened the bond between our local primary and high schools, working together with renewed focus and determination to support the students to be curious and creative in their science learning as a community.

Next time...

For our GSSfs event next year, whatever form it takes, we want to build on the collaboration of this year's event, developing the transitional links further by recruiting STEM Buddies from the secondary students to support the event, and encouraging them to produce their own demonstration videos for the junior pupils. The opportunity for children to ask questions of the scientists and teachers around them was really powerful, so we hope to do this as

a face-to-face event next year, if possible and, if not, we will adapt again and will make it happen. We want to continue our supportive and collaborative local community and build on what we have learned from this year, continuing to work together because, it is true, together we are stronger!

If you haven't had the opportunity to be part of the Great Science Share for Schools yet, we would definitely recommend it. Getting colleagues and the local education community involved together has been so rewarding; everyone should have the opportunity to get involved, young people and teachers.

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- <https://practicalaction.org/schools/>
- <https://ed.ted.com/earth-school>
- <https://encounteredu.com/steam-activities>

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James Dunn is the Science Core Curriculum Lead at Guiseley School, Leeds.

A high school teacher's perspective

The feedback I've received from the primary students relating to the investigations we've posted has really encouraged me to strengthen the links with local schools even further, and to engage with more of the pupils.

Videos like Elliot's homemade stomp rocket inspired by my Stomp Rocket investigation or Ben's Skittle chromatography experiment inspired by my diffusion investigation, have been really motivating to see. During the time in lockdown, when it was all too easy to look inward, we have been able to both look outward and grow. I'm looking forward even more to the new cohort of Year 6 [age 11] moving into my school in September.

I'm eager to discover the depths of understanding of our new shared vocabulary as pupils make the transition to secondary school, and I can see that primary pupils already gain a good understanding of scientific vocabulary that will transfer and progress as they move to high school. We have a good base to develop from.

#AskAHighSchoolScienceTeacher was a really enjoyable experience and responding

to the science questions that primary students were keen to know the answers to was fun. They included questions such as 'Why do we have earwax?', 'When did time start?', 'Why is the sky blue?'. These highlighted the current knowledge, understanding and curiosity of primary students and will enable my team of science teachers in high school to smooth the transition into the high school level of understanding.

Some really put me on the spot, but what a great experience! As secondary practitioners, we sometimes forget the fundamentals of science, the questioning of the world around us. I felt enthused by their curiosity to ask these questions, which are just as important as questions from great scientists of the past who have helped shape our understanding of the universe going forward. The future is bright, these young scientists can use that innate curiosity, shaped by our shared, finely honed best practice, to become problem-solving scientists of the future who can solve our sustainable development issues.

Sharing our passion for science



Nematodes – tiny worms that are the future for biological pest control



Dr. Julia Maclachlan and Dr. Geoff Mackey explore how BASF is inspiring the next generation of young scientists through the Great Science Share for Schools

What do the wrapper of your chocolate bar, your smartphone, your shampoo, the paint on your car and solar panels have in common? They all rely on products and innovations from BASF. From pigments to adhesives, super-conductors and cathode active materials, we supply such a diverse range of industries that, if you had to sum up what we do in one sentence, it would be 'We Create Chemistry'.

About BASF

BASF is a global company with 117,000 employees and, to put that into perspective, there are enough of us to fill a city the size of Chester! Whether we are producing polymers in Nanjing, China, making the highly versatile substance that makes Post-it notes sticky and chewing gum chewy (Oppanol) at our headquarters in Germany, or manufacturing and supplying polyurethanes right here in the UK at our Alfreton site, what connects us all is our love for scientific innovation. As a company, our aim is

to develop solutions for the greatest challenges of our time – so we can better protect the climate, make optimal use of limited resources and provide food, energy and clean water for a growing global population. We have sites across the UK and Ireland, reaching from Littlehampton on the south coast, where we breed nematodes, to the Isle of Lewis on the Outer Hebrides, where we manufacture highly concentrated omega-3 fatty acids for pharmaceutical and nutritional applications. But we don't just want to create chemistry; we also work to inspire the next generation of young scientists. We aim to shift young people's thinking so that they have greater awareness of who can be a scientist and how diverse STEM careers can be.

How are we involved in the Great Science Share for Schools?

Our passion for science and a commitment to promote science education is why we support the Great Science Share for Schools (GSSfS). We offer:

- #AskAQuestion profiles of our employees, especially promoting women in STEM;
 - incentives for schools (science dictionaries in particular!);
 - advocacy within STEM industry networks and government;
 - annual funding to support the GSSfS patchwork quilt funding model; and
 - advice and guidance to the GSSfS team.
- What we gain:
- a brokered, meaningful and credible engagement with teachers and pupils UK-wide and beyond!
 - engagement of our staff virtually and also physically at GSSfS events;
 - positive messaging within our own sector through GSSfS multiple Awards, including the National Chemical Industries Association Reputation Award;
 - support and collaboration through joint activities, e.g. the Big Bang Fair, ASE Annual Conference; and awareness-raising through having our name and logo on GSSfS marketing and communications: websites, certificates, social media, etc.

Keywords: Innovation ■ Education ■ STEM ■ Women in science ■ Chemistry

'To create a strong, bright future, we have to encourage young people to be full of questions, creativity and innovative thought. The Great Science Share for Schools is a fantastic example of an evolving and growing initiative, which encourages this on a massive scale. We have always believed in the Great Science Share for Schools. For all our futures we have to collaborate and invest in these types of outreach initiatives. We are proud to be working closely with the University of Manchester and other partners on the Great Science Share campaign, which we saw make such an impact in 2020' (Dr. Geoff Mackey, Corporate Affairs & Sustainability Director).

Memorable GSSfS experiences so far
Reaching out to schools nationwide through our commitment to providing schools with BASF dictionaries as part of Great Science Share 2018:
<https://twitter.com/ctkrps/status/1009359622413717504?s=20>



The message to industry as to why get involved in the GSSfS or similar initiatives is simple. As we face the challenges of the future, we need groundbreaking science at the heart of everything we do, but we also need people at the forefront of technology to help us develop sustainable and safe production techniques. We need creative minds to help us market our products in new ways and we need sharp communicators who can explain to society the role of science, in a way that we've not been able to before. We can't get there without new and different talent, and we can't attract

those talented people without a culture of inclusivity and inspiring a diverse new generation of scientists. For BASF, this means that reaching out to young people across the country is now more important than ever. The Great Science Share plays a key role in exploring new ways in collaborative scientific learning and thinking, allowing more young people to join in and shape the conversation about the role science can play in building a better future.

Other work we do with primary schools: ScienceXperience

'What does a scientist look like?' is one of the first questions we ask the primary

The Etihad experience of 2017!

An Etihad campus experience for Great Science Share 2017, with Geoff inspiring the young people about science in the palm of their hands.



(Above) Visiting MRI during GSSfS 2019
A visit to Manchester Royal Infirmary saw Lisa Kelly, Head of BASF's chemical distribution business, BTC, and Dr. Geoff Mackey delivering goodie bags and seeing children on a urology ward taking part in science investigation with parents at their bedside, as part of the Great Science Share 2019.

Looking ahead to another bumper year!



school children who come through the doors of our ScienceXperience, which is a hands-on learning experience and school outreach programme at our Alfreton site near Derby. This is designed to introduce children to the exciting world of chemistry and awaken their passion for STEM subjects. After hours of making slime and conducting investigations that challenge them to think like a scientist, their ideas about what people in STEM careers look like are often completely transformed. 'Not all scientists have crazy hair!' said one, while another marvelled 'I didn't know that everything was made of chemistry', during a recent visit.

'At BASF we take a holistic approach to promoting STEM subjects to the next generation of young scientists. Our aim is to promote BASF, the chemical industry and inspire young people in STEM subjects. Our STEM and WISE (Women in Science and Engineering) Ambassador programmes are key pillars of our outreach work, enabling pupils to achieve their potential in STEM' (Richard Carter, Managing Director UK & Ireland).

BASF volunteers in school

BASF staff work with the STEM and WISE national networks by visiting schools to show young people how varied and diverse a career in science can be. They also take their outreach work to some unusual destinations, such as the Bluedot festival at Cheshire's Jodrell Bank observatory, which combines music and science and delivers hands-on teacher training, with the Royal Society of Chemistry supporting educators to be more science aware and allowing them to pass on their excitement for STEM subjects to their pupils.

Dr. Julia Maclachlan works in Communications at BASF plc. She also followed an unusual path into the world of science, having recently completed her PhD in Modern European History at the University of Manchester.

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Dr. Geoff Mackey is Group Corporate Affairs & Sustainability Director. A first degree in ecology and a doctorate in social networking give him a wide perspective from which to drive BASF's UK STEM outreach work.
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Two Greats are better than one!



James Hickman reflects on the impact of two Great Ormond Street and University College Hospitals' Great Science Shares embracing the challenge of an ever-changing cohort of pupils

Context is important

Having trained and worked as a mainstream secondary science teacher, I moved to being a science teacher at The Children's Hospital School at Great Ormond Street (GOS) and University College Hospital (UCH) in London. In this role, I teach science to pupils across the primary and secondary age phases.

With a staff of over 40 teachers, we meet the challenge of a pupil cohort changing on a daily basis, working across two sites and hospital trusts. The hospital schools provide education to children who are in-patients when they would otherwise be in school. We work across a wide range of wards at GOS and across 4 paediatric and adolescent wards at UCH, providing education to children from age 4 years upwards, either by their bedside or within one of the three school rooms on each site.

When I first became aware of the Great Science Share for Schools (GSSfS) in 2018, I instantly thought that it was something that would be near impossible for us to be a part of. The network of

local primary schools were organising an event in which their pupils would join to share their science. I knew that we could have children plan an investigation, carry out their investigation and record their findings, and we could help them find ways to communicate their findings with a wider audience. These were all part of our normal day-to-day science practice, but the issue was the logistics!

There was no way that I would be able to know who, if any, of our pupils would still be with us in June, never mind then being able to organise getting them from hospital to another venue to share their science with a wider audience. I scoped ideas such as me taking their work over to the event myself to show what they were doing, but it felt that that would be missing the point. However, the GSSfS as a concept had struck a chord with me and I was determined to find a way to include our pupils, for two key reasons:

1. Science is all about communication. There is little point in formulating questions, ideas and personal theories or investigating the structures and functions

of living things if you aren't going to share it with people. Too often, for me, the curriculum focuses on the need for knowledge and ignores this critical tenant of sharing science, which is so important in the real world. Knowledge is useless if it's static. This event gave a focus to this key skill and I felt that we could use this to also highlight the vast array of ways in which you can communicate science. Science is creative, and science should be shared, so why not be creative in the way you share?

2. We are a child-led school. As much as we are working to minimise the disruption that the child's unique situation may cause on their educational journey, we aim to make that journey with the child feeling some control over the direction. Children in hospital find themselves in a situation where, for almost every aspect of their medical care,

Practical science brought GSSfS to life on the hospital wards



Keywords: Hospital school ■ Child-led ■ Inclusive ■ Communication

BASF
We create chemistry

Education is key to individual personal success and a sustainable society.

It opens up opportunities and is vital for participation and integration. That is why BASF focuses its social engagement efforts on education and engages in a large number of projects – from daycare to university level – all over the world, especially near our company sites.

As the leading chemical company, BASF aims to stimulate an interest in science and foster curiosity. In hands-on science and chemistry workshops, girls and boys get to be researchers and discover the world of science.

www.basf.com



Children's questions were at the heart of the GSSfS

they are not in control. When it comes to their education, giving them choices and letting them lead are vital ingredients to a successful educational relationship.

The plan and its implementation

With the support of the Great Science Share team, I decided on the idea to create a video in which children could share their science when in hospital. We could start early and collate what they did, showcasing it on the campaign day in June. This meant that all pupils could be included; whoever wanted to get involved could take part regardless of their position. The video idea was something with which we were familiar to create whole-school collaboration, and which had previously been successful. Keeping our child-led approach, I left the scope of what and how to share science as broad as possible.

My plan was basic – allow teachers to do what they normally do and collate the work they record, then work with a more technically savvy colleague to create our video. We would share it through our social media channels on the day and it would be premiered through live streaming by the central Great Science Share team. We use a secure online platform to allow teachers to post the work of willing pupils onto this space to celebrate work, share success and feel connected as a community. Throughout the year, this platform became full of exciting science being shared by a wide range of pupils across the entire educational spectrum and I felt very excited at the prospect of collating all this into a video. We had lava lamps, electric dough, magical floating fish, bouncing slime, wind-up cars and catapults (to name a few), all being the subject of scientific investigations by our pupils and, now, it was my job to put it all together to provide a snapshot of the science we, as a school, wanted to share. A few weeks before the event, we started to put this work together into a video and, after a labour of love,

the video went into the digital world to represent the first hospital school participation in the Great Science Share.

The impact

It was now time to reflect. Although we had reached the other side of this process and taken part in our first Great Science Share, I couldn't help but feel somewhat deflated. As much as the video reflected the wide range



Electricity-conducting playdough stimulated more questions about light and circuits

of science investigations with which our pupils engage, the day itself had passed without any great focus on the act of sharing science. To take part in something that had felt such a close fit with the way we worked and be left with some sense of disappointment meant that I needed to start asking questions.

Firstly, would we do this again next year? Secondly, why did I feel disappointed and did other staff feel the same too?

I set up a staff survey and, although I knew that the way I had presented and organised this was by no means perfect, I could not have predicted the feedback I received. It highlighted how my own passion for the project had given me tunnel vision!

- 40% of staff had been unclear on what work could be included in the project; and

- 60% of staff felt that I had added extra work onto their workload.

Not an easy read, but really vital to hear. It also felt somewhat ironic that, as a teacher who needs to be able to continuously gather and make use of feedback from pupils to meet their educational needs, I had managed to forget to gather feedback from the teachers with whom I was working throughout this process.

Supportive feedback from staff allowed me to see that the minimal scaffolding had created the opposite of the intended effect – instead of freeing up staff to go in whichever direction the children wanted, it raised a lot of questions and stumbling blocks. Staff had also felt as though I was asking them to complete additional whole-scale investigations on top of the work they were already doing, as opposed to collating the work that was already happening and sharing it with a wider audience.

I was also keen to find out the views of pupils we worked with; however, the transient nature of the cohort and the nature of the video being released at a time when almost all the pupils had left hospital meant that this wasn't possible.

The evolution

The 2020 GSSfS plans were set back due to the COVID-19 pandemic; however, it didn't stop me reconsidering what I want the experience to be for our future pupils.

Giving pupils the freedom to choose what they investigate was already part of their experience and they were already sharing aspects of their work on our digital platform. This opportunity can be built upon and I want their experiences to be closer to that of scientists working in the real world. I want to really highlight the link between science and creativity too, and to give pupils who were not with us in June an opportunity to take part. I want to give clearer scaffolding to staff so that they are more confident and ensure that it doesn't add to their workload.

The way forward:

- Pupils would all be given one basic investigation that they would all carry out, which would be simple and focus in the first instance on how creatively they shared the outcome of this practical.

- Pupils and teachers could extend the investigation to allow for freedom of choice in how they took this investigation further, if they wanted to.

- This investigation work would be carried out during Science Week, in mid-March, so that everyone would be working on this at the same time and it would link in to an event we already focus on, thus not adding to the workload of staff.

- A greater sense of focus and collaboration would be encouraged and the shares produced would be collated into a video that we would screen with the pupils who were with us on the day of the Great Science Share itself.

- Pupils would take on the role of peer

reviewers and either take the outcome of the previous group's work and try to replicate this, or take the work and try to build on it, thus replicating the way science in the real world is shared, reviewed and built upon.



The investigation idea: 'Which 3D paper shape can support the most mass?'

Pupils were given a cylinder, triangular prism and square prism structure to start with, with no method and two aims: devise a method and share your findings in whatever way you choose, be that through a write-up, story, images, video, poster, poem, song, or any other way they wanted. I knew our staff had the skills and ideas to support the children with the creative side, and a very enjoyable staff meeting carrying out the investigation for ourselves meant that we discussed and came together to test what methods we could use, find solutions, and for everyone to then share their ideas.

The hospital as a learning environment

The hospital is paradoxically a great source of inspiration and collaboration whilst also being incredibly isolating and restrictive. The hospital school environment is incredibly inspirational and collaborative in two ways: firstly, we represent all sectors of mainstream educational provision (early years, primary, secondary (including A-level) and Special Education) within our staffing structure. That means that I, as a secondary science specialist, work with fantastic teachers from three settings with whom, in mainstream, I would never interact. This daily collaboration has had a huge impact on my own individual practice as a science teacher, allowing me to begin to understand where science sits in each of these three settings and to see how powerful a tool the subject is, across all settings, for engaging pupils in active learning. It has

also allowed me to bring my knowledge of content and ways to apply this to these new settings and support non-specialists in their delivery of the subject.

The hospital environment provides a great source of inspiration, and collaboration is in the access we have to world-class medical research and the people involved in delivering this. Not only do we use the frontline professionals we work alongside as science capital, making pupils aware of the wide range of people and careers involved in their own medical care, but we also have these professionals come to the pupils and talk about their work, highlighting what happens in the corridors and rooms of the

Strongest structure challenge



hospital that they don't get to see. This direct contact with the people of science is such a powerful tool in engaging children with the subject and we are very fortunate to have the access we do.

The reality, however, is that every one of our pupils is isolated from the world outside of the hospital, some more so than others. Many of the pupils we work with cannot leave their hospital room during their admission. For those that can, their medical care will always come first. For all these children, their health will fluctuate during their admission. This means that no one child can guarantee that they will be able to engage in education for five days a week and, even if they do, for some it will be in complete isolation. This means that collaborating with their peers is difficult and, although we have ways and means that allow

us to do so, we can never replicate the feeling of being back in your class, in your school, with your friends, which most of our pupils will crave. This isolation is also then compounded by the restrictions imposed on how we educate our pupils.

Science in hospital schools also has more restrictions imposed on it than most; these include limited science equipment, the challenge of the spaces in which to work (most of our teaching is by a child's bedside), infection control measures (which everyone will now be, sadly, very familiar with) and movement restrictions, to name a few.

When you put these two opposing aspects of our work together; the inspirational collaboration and the restrictive isolation, this paradox creates a breeding ground for some incredibly creative practice. It is this understanding of how our environment shapes our work and the skill of our staff in working in this environment that both drew me towards the Great Science Share and made me keen to want to share this work, with the wider world, through a video.

A look ahead

Although the pandemic halted our work from March onwards, it is only a pause. The outcomes from the Science Week investigation were inspiring and creative enough to help me feel as though I had achieved what I was aiming for, even though we couldn't complete it fully. I certainly wasn't left feeling disappointed and staff shared positive feelings and comments about this year's experience. Now all I have to do is to reflect again, gather some staff and pupil feedback when possible and start to plan for next year! For me, it's not only the fact that two 'Greats' are better than one... what we find is there are many positive aspects to feeling part of the Great Science Share for Schools community, and I look forward to discovering what more we can do to improve children's science learning experience, even when in difficult times whilst in hospital.

James Hickman is a science teacher based at The Children's Hospital School at Great Ormond Street and University College London Hospitals. Follow The Children's Hospital School on Twitter at @GOSH_School



The Thornton Primary STEAM Team 2018

Hayley Sherrard and Joanne Jarvie review the GSSfs Cook-along that has enabled children to share science far and wide

Great Science Share takes to the air!

As an accredited provider of professional learning opportunities, health and safety advice and support for STEM educators in Scotland, SSERC has been a long-term supporter of the GSSfs – raising the profile of the campaign throughout Scotland over the last five years. As the 2018 campaign got underway, SSERC decided that the time was right to take an even more active role in supporting the event. But as we began to put plans in place, a key question arose... how could a leading provider of STEM professional learning for educators bring pupil voice directly into our contribution and do justice to the aims of the GSSfs?

The answer was surprisingly close at hand – to work with pupils at a local school to produce and broadcast their own version of SSERC's live interactive professional learning model (the SSERC Meet) directly into classrooms across Scotland.

Pupil-led live interactive science

For 10 years, SSERC has been broadcasting SSERC Meets – professional learning events where teachers join in a live, interactive

'cook-along'-style workshop from the comfort of their own schools. Typically running as a two-hour twilight, colleagues take part in investigations, activities and discussions with other practitioners from across Scotland. The sessions are fully resourced – all schools receiving a box of kit to support the activities covered in the SSERC Meet. The content is a mix of live presentation and pre-recorded videos, broadcast via Adobe Connect technology.

We knew the model was successful and popular with teaching staff – completed evaluations showing that 99.5% of participants rate these events as either 'very good' or 'good'. In 2019, 28% of SSERC's early years and primary activity was delivered via SSERC Meets. However, would this model work as a pupil-led event produced by pupils for pupils as part of the GSSfs?

● It became apparent that there were a number of key points that had to be taken into account when planning a pupil-led GSSfs SSERC Meet: Due to the potential number of schools involved, resources could not be

supplied;

● The content of the session would need to inspire pupils of all ages to explore their ideas after the event, stimulating questions and providing a range of potential investigations that the class teacher could support;

● The practical activity would need to fit into the school day and be as accessible as possible; and

● The event would be planned and delivered by a group of pupils – with SSERC support provided for filming and broadcasting.

So, where to find a group of pupils willing to get involved in this project and a teacher able to support them in this innovative project? Step into the picture, Thornton Primary and their fabulous pupil-led STEAM Team along with their teacher, Joanne Jarvie (Primary Science Teaching Trust Fellow



O-wing glider

and SSERC Primary Cluster Mentor).

Flights, camera, action...

Working closely with the STEAM Team, two ideas for GSSfs SSERC Meets were developed, both with a focus on forces. O-wing gliders were chosen in 2018 and rocket mice in 2019. Both activities required simple resources and were accessible to pupils of a range of ages – important considerations if these interactive, practical sessions were to be a success.

The STEAM Teams put together storyboards and scripts, rehearsed and carried out the activities in front of the camera. In both films, the STEAM Team focused on explaining the science, as well as demonstrating how to carry out practical activities in real time. The STEAM Team provided ideas for further investigations and supporting and inspiring pupils (and teachers) to carry on investigating after taking part in the initial event.

Once the films were finished, edited and uploaded onto SSERC's Adobe Connect platform, all was ready for the live GSSfs events in June. Recruitment was rapid and over 60 schools from across Scotland signed up to take part. We decided to limit the number of schools to 60 to ensure that the STEAM Team could answer any questions in real time. Each school received a link to access the event, along with supporting materials and a list of resources required.

Going live!

The STEAM Teams arrived at SSERC HQ on the day of the GSSfs, ready for final preparations. Both STEAM Teams were incredibly professional in front of the camera and mastered the technology with ease. The session interspersed the pre-recorded videos with live presentations by the STEAM Team members, pupils taking part alongside the videos and carrying out the practical activities in real time. The sessions were broadcast live, running from 11:45am to 12:30pm, fitting in with the school timetable and allowing time for further pupil-led investigations throughout the rest of the day.

The participating schools were not visible on screen – all schools



Rocket mouse ready for blast off

communicated via the Adobe Connect chat facility, asking questions and sharing updates. Schools also shared photographs via Twitter.

How did it go down?

Every school was asked to complete an online evaluation form – providing information on the number of pupils taking part, their experience on the day and any feedback that would help to improve

future sessions.

In 2018, 27 out of the 63 schools registered completed the online evaluation. These 27 schools reported that 595 pupils took part from these settings. 96% of pupils indicated that they would 'definitely' like to take part in another GSSfs SSERC Meet and the remaining 4% said 'possibly' – depending on the theme.

In 2019, 65 schools were allocated a place – 30 schools completed the evaluation form after the event, reporting that 898 pupils took part from these settings. Feedback indicated that 87% of pupils would 'definitely' like to take part in a future GSSfs SSERC Meet and 13% said 'possibly'.

Evaluations from both 2018 and 2019 showed that pupils from across the primary age range took part in the event. There were a number of examples of entire schools taking part together – older pupils working with younger ones.

As the event is streamed live into schools, the smooth running of the videos is dependent on the individual schools' connectivity. There were some comments about technical issues in the evaluation forms – some schools reporting a delay in the video streaming or problems with sound. As these potential issues had been anticipated in advance, all registered schools received support materials to ensure maximum participation and to help with follow-up investigations.

Some quotes from completed evaluations:

The activity was engaging and it was lovely to watch other children teaching the lesson.

You made sure we could understand the activity and we could message you if we had any problems.

I liked that the children led the lesson. My class responded well to this and thoroughly enjoyed the end result.

Resources were easy to follow and explained everything needed to carry out the activity.

Technology let us down at the school and we were still able to complete the activity.

Activity was achievable, easily organised but very engaging! We were able to see and understand the science and talk about what was happening, as well as how to improve results.

We liked the concept of making the rocket mouse. It was great to see the other schools and speak to everyone live. It was so interesting to see the live video on the screen and we were so excited!

The demonstration and guidance from other pupils – the children responded to that enthusiastically.

Fun and a great learning opportunity. Crosses all primary levels.

GSSfs 2020

Obviously plans for the 2020 GSSfs had to be changed due to COVID-19, but as our contribution to GSSfs has

Making the O-wing glider – image shared via Twitter



Keywords: Technology ■ Collaboration ■ Scientific enquiry



Ready to make O-wing gliders – image shared via Twitter

than ever to make use of online platforms to share learning and ideas on both a large and small scale. Our evaluations show just how much pupils value and engage with peer-to-peer teaching online, so we see the potential

for more opportunities for this type of interaction in the future.

SSERC's unique way of supporting the GSSfs has inspired pupils from Avoch Primary School in the Highlands to make a range of their own 'cook-along' science videos during lockdown. They were supported and encouraged by their teacher, Cath Milne (PSTT Fellow and SSERC Primary Cluster Mentor). The videos can be viewed via the SSERC TV YouTube channel: <https://tinyurl.com/yxhrtzrq> <https://tinyurl.com/yyy6mrtq> <https://tinyurl.com/y36kymaz>

Both GSSfs SSERC Meet sessions (O-wing gliders and rocket mice) have a strong link to physics – a stimulus for exploring and explaining forces. Our ongoing research shows that some primary teachers lack confidence

in teaching this area of the science curriculum and so it would be interesting to explore how the pupil-led GSSfs SSERC Meet supports practitioner professional learning.

SSERC continues to support the GSSfs and will be one of the new GSSfs Regional Champions for Scotland – plans are already in the pipeline to make the GSSfs SSERC Meet in 2021 even bigger than ever!

Hayley Sherrard is Senior Education Manager at SSERC. SSERC is a Scottish Local Authority-owned organisation, providing accredited professional learning opportunities, health and safety advice and support for STEM educators across Scotland and beyond. SSERC acts as the Lead Liaison for STEM Ambassadors in Scotland and leads the Young STEM Leader Award Programme.

Joanne Jarvie is a teacher at Thornton Primary, located near Kirkcaldy in Fife. There are 234 pupils on roll, including a nursery. Thornton Primary has a thriving pupil-led STEAM Team and was awarded the Education Scotland STEM School Award in 2016

taken the form of a virtual event since 2018, we already knew that this type of remote session was both practical and engaging. As an alternative to new sessions for 2020, SSERC edited footage from the 2018 O-wing glider event to make a pupil-led lesson that could be followed by children working at home or in hubs across the country. This lesson was shared as part of the main GSSfs day on 16th June 2020. This recording is currently still available to view at <https://www.youtube.com/watch?v=BgxUMedVSIU&feature=youtu.be>

Where next?

The events of 2020 have given us all time to reflect and adapt – circumstances have made it necessary for more educators

Enjoying learning with scientists

Opening a can of worms!



Jayne Quoiani and Nicola Stock explain how the Great Science Share for Schools encouraged children to get hands-on with contemporary scientific research in Scotland

breaking down barriers to engaging with science, through challenging existing stereotypes and revealing who scientists are and how they use the scientific method in their work.

Our primary school programme offers engaging, hands-on activities for pupils and their teachers. Linked to the *Scottish Curriculum for Excellence*, with an emphasis on talking to real scientists, they expand scientific vocabulary and build confidence in science. To extend the reach of our engagement and as part of the Great Science Share for Schools (GSSfs), we developed a free toolkit, *Opening a Can of Worms*, which supports teachers and 9-12 year-olds to use the scientific method to study animal behaviour in their own classrooms.

Since 2018, we have engaged over 1000 local school pupils through the GSSfs and have extended engagement through a free-to-download online version of the toolkit to 12,000 people globally. During the 2020 pandemic, a home-learning version of the toolkit brought real-life research to a further 5,000 school pupils in their homes across the UK.

Building partnerships

In 2018, when the Easter Bush Science Outreach Centre (EBSOC) was only a few months old, we heard about the GSSfs campaign and knew that its aims and values aligned perfectly with the objectives of the Roslin Institute's Public Engagement Strategy. We decided to jump on board, starting our GSSfs journey on a small scale with just a single class of 22 pupils from one local primary school. The experience was incredibly rewarding for us, reflected in teacher comments too!

'Our involvement in the GSSfs was both positive and motivating for pupils and staff. The ownership that the children had over their own investigations, being decision makers and working alongside scientists, brought their findings to life. This had a further impact on their understanding of how science works and on their

Based at the University of Edinburgh's Roslin Institute, we are a small team of public engagement with research professionals. We promote and facilitate interactions between our scientists and the public by creating accessible events and resources. The Roslin Institute, made famous by the creation of Dolly the Sheep in 1996, is a centre for animal science research funded by the Biotechnology and Biological Sciences Research Council and is home to around 500 research scientists and technical staff, postgraduate students and vets. Our public engagement activities have a strong emphasis on

The EBSOC team!



Keywords: Scientific research ■ Scientific method ■ Science capital ■ School-university partnership



Delivering sustainable improvements in primary science teaching and learning

The PSQM programme provides a framework that enables science subject leaders to develop and strengthen their leadership practice, whilst increasing the profile and quality of science within their school. The process supports subject leaders to plan for improvement in science teaching and learning across the school and evaluate the impact of action taken. PSQM enables schools to evaluate and improve all aspects of science teaching and learning, raising the profile of science and inspiring staff to make connections between science and other subjects. PSQM facilitates links with outside organisations to further enhance science within school, improves children's science capital and the final accreditation evidences and celebrate the schools' commitment to a broad and balanced curriculum.

What does the cost of PSQM include?

- The cost of taking part in PSQM in 2021-22 is £850. This includes:
 - The equivalent of 2 days training delivered in live online sessions, for two members of staff (normally the school science subject leader and another member of staff)
 - on-line mentoring throughout the process
 - a framework for self-evaluation and development
 - all PSQM resources via the PSQM VLE
 - a framed certificate (upon successful completion of PSQM)

“Children are now asking more questions, aspiring to work in a STEM related career and taking part in more science related activities at home. The children love investigating and are now naming and using scientific enquiry skills more confidently.”

Science subject leader, PSQM School



“I have seen the lasting impact of PSQM through both science teaching and learning in my school. In particular I am thrilled to see children who are able to articulate their science learning with a new depth of confidence and understanding, something noted by an inspector in our recent Ofsted inspection.”

Headteacher

Further information: Please see the attached case studies of schools who have participated in PSQM. Further information about PSQM can be found at psqm.org.uk or please email psqm@herts.ac.uk

confidence to share their results with others. It was fantastic as a teacher to witness and it was a great opportunity to collaborate with our local research institute' (Tori Trueman, P5 class teacher).

In 2019, to spread the word about the GSSfS, we organised information sessions in EBSOC for colleagues from across the University of Edinburgh, as well as other higher education organisations, local STEM organisations, local authorities and government education teams.

We ran teacher and STEM leader meetings for our local primary schools, with the aim of building up a working group of GSSfS Teacher Ambassadors to develop and share the campaign with their schools and school leaders. From these interactions, the GSSfS Midlothian Primary School STEM Cluster Project was born and we are currently working with P5-P7 classes (age 10-12 years) at four local primary schools, with around 20 teachers and 600 pupils.

Keeping it real

Roslin Institute scientists come from a range of social and scientific backgrounds and they work with a huge variety of animals, from poultry to pigs and bees to salmon, with the aim of improving animal health and welfare. Their research can be complex, abstract and difficult to make relevant to school pupils and their teachers, and can be challenging to talk about, such as the use of animals in research. A recent UK government survey shows that there is a desire from the public for more direct engagement from scientists, in particular around the societal and ethical implications of their research (PAS, 2019).

Teachers told us that the main barriers to doing more hands-on science in their own classrooms were confidence, time, resources and a pressure to focus on numeracy and literacy. They asked for more support to use the scientific method in schools. This knowledge led to a new resource that aimed to:

Scientific method
'There is no end to the scientific method cycle; this positive feedback loop means that the results from one inform the next.'

- increase their confidence and that of pupils in using the scientific method;

- raise awareness of how science is carried out in the real world and by whom;
- give our scientists an opportunity to get real experience of working alongside local primary children; and
- offer a tangible way to effectively engage upper primary pupils with contemporary research.

The toolkit: Opening a Can of Worms

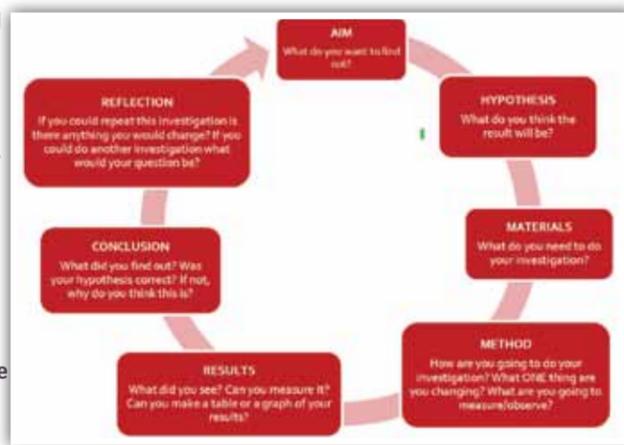
Opening a Can of Worms supports teachers to use the scientific method cycle with their pupils via a series of simple, pupil-led experiments using earthworms. It encourages pupils to create their own scientific questions and helps teachers to facilitate good-quality, hands-on learning.

The toolkit highlights the importance of studying animal behaviour, introduces the use of animals in research and gives teachers and pupils some practical experience of designing their own investigation using the scientific method as a framework, while also considering the welfare of the worms.

The toolkit includes:

- all the equipment needed, including the worms!
- teacher guide* (including links to the science curriculum, literacy and numeracy skills)
- pupil workbook*; and class presentation*.

*These elements are also available as a free digital download.



'My class really enjoyed carrying out the research question and all the equipment provided was excellent.' 'Brilliant activity and very well resourced. Children were engaged, interested and excited about the investigation.'

Professional development

In addition to the impacts on pupils, taking part in the GSSfS allowed us to pursue our strategic objectives of building a network of local classroom practitioners and increasing their confidence in STEM, and developing the engagement skills of our scientists.

One teacher from Strathesk Primary School said that she got involved because she wanted 'to bring in more science into the classroom. Get children more interested in STEM jobs and so children can get more hands-on in science and sharing their learning'.

Many of the teachers said that they hoped to gain more confidence in teaching science, using the scientific method themselves and supporting their pupils and colleagues to use the scientific method.

Research staff and students also benefited from the experience:

'I gained experience in improving my communication skills and encouraging kids to think scientifically in a very simple way. The enthusiasm of the kids to learn more about my work in chickens has encouraged me to continue supporting

Typical timeline of GSSfS activity across an academic year

December	February	March	April/May	June	June/July
First meeting for teachers, STEM organisations and HE colleagues – introductions and scene-setting	Teacher professional development session to review practice and gain feedback from teachers about how to use the toolkit	EBSOC team creates the toolkits and delivers them to schools	Teachers work with pupils to create their investigations using the toolkits in school	Visits to schools with scientists – pupils share their science!	Evaluation of project – pupil, teacher and scientist perspectives

GSSfS and do as much as I can to help kids in building up their scientific thinking if they wish to be future scientists' (Marwa Hasan, PhD student).

All the teachers agreed that the project provided an opportunity to learn about real-world science and, when we asked teachers what they thought the impact of the project was, they said:

'It was so important to have visitors coming as they link the learning to the world of work and jobs out there.'
'It made science "real" for them and introduced them to the working world of science.'
When asked, pupils said:
'It was fun to experiment and find your results.'
'It was inspiring.'

Reflections

There is concern that too few young people are choosing to study science beyond 16 years old, and that those who do pursue STEM subjects via higher education and STEM careers do not reflect the diversity of the UK population (Archer, 2013). Of the eight dimensions of Science Capital (Godec et al, 2017), our evaluation and experience suggest that this project has a significant positive contribution towards four:

Science capital dimension	Approach
Scientific literacy	The toolkit includes a <i>Real-Life Research Fact File</i> , a critical reading text to introduce and/or develop pupils' knowledge about how science works and an understanding of the real-world science that is happening in their local university. We noted improved scientific literacy – when asked, 90% of the pupils understood what 'aim', 'hypothesis' and 'conclusion' meant after the 2018 GSSfS project.
Knowledge about transferability of science	The toolkit focuses on using the scientific method and exercising broader scientific skills such as problem-solving, resilience, teamwork and communication. 80% of the pupils that took part in the 2018 GSSfS project said that they could design an experiment again.
Knowing people in science-related roles	The GSSfS experience includes a school visit from scientists who are working in their local community. During these visits, we facilitate discussion between the pupils and the scientists to create meaningful interactions. Getting a chance to meet 'real scientists' is often reported as one of the highlights of our GSSfS sessions by the pupils.
Science-related attitudes, values and dispositions	Encouraging pupils to create and direct their own investigations and share their science with professional scientists placed value on their contribution. Meeting our scientists also reveals STEM careers and helps challenge typical educational and social stereotypes of scientists.

Our PhD student Marwa, enthusiastic to support primary scientists in the Great Science Share for Schools

For us, as public engagement champions, being part of the GSSfS has enabled us to fast track the building of strong, collaborative, long-term relationships with our local schools, and gives:

- local children the opportunity to investigate real-life science, meet real scientists and improve their science capital;
- local teachers the confidence and support to work scientifically in their classrooms;
- our scientists positive opportunities to communicate their research and develop their science communication skills; and
- our organisation an opportunity to have a meaningful impact in our local community.

For the 2021 GSSfS Midlothian STEM Cluster Project, we aim to do a more robust evaluation of the impact of the project on science capital and continue to evaluate the impact of this project



on teacher and researcher professional development. Jayne is also embracing her role as Great Science Share Regional Champion!

Resources

Opening a Can of Worms and Science @ Home: Wonder with Worms investigation pack can be downloaded for free from www.ebsoc.ed.ac.uk

Primary teacher workshops at EBSOC, *Getting Hands-on in your Classroom with the Scientific Method*, based on this toolkit, with a bag of equipment to take back to your classroom. To find out more, visit www.ebsoc.ed.ac.uk

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An international Great Science Share for Schools experience in Nepal

Helen Woodward shares her insights into linking The Derby High School in Bury to the remote Himalayan mid-hills in Nepal



Helen introduces the GSSfS investigation to the pupils

asked me to show the film again so that they could follow the instructions and make the paper helicopters. They spontaneously tried out different-sized helicopters and investigated what happened when they dropped them from

different heights, counting down to start the timer so they could record their findings. Older children helped the younger ones; everyone joined in.

In the middle of all the activity, we still managed to capture some footage to share with the children back at The Derby High in Bury.

For the children in Nepal, knowing that they are thought of and connected to children in a school on the other side of the world is significant. The values that the Great Science Share has of inclusivity, non-competitiveness and collaboration fitted so well with why this was the right project to take to Nepal.

The child-led nature of it meant that they and I could ask questions without feeling that we were going to get it wrong. Of course, the Nepalese children had all sorts of questions about the Derby students: How old are they? What religion are they? How many children are at their school? Seeing the children in Bury take their science investigations seriously inspired them to begin experimenting too. Participation in the GSSfS was eye-opening and hugely empowering because they knew that people had invested in them even before I arrived.

Regarding the pupils in Bury, Lynn Provoost (Assistant Headteacher, Derby High School) says:

'We strive to provide as many rich opportunities for our students as possible – this was no different. The opportunity that our pupils could reach out to inspire children in Nepal was amazing and something that inspired them. They leapt at the chance and came up with ideas to bring a film together, including demonstrations, explanations that profiled the science, but also who we are at the Derby! Communicating in this way engaged many pupils in designing, filming, editing and

to the Gulf States and work just to send money home: Kamal and his team struggle (as do educators all over the world) with the challenges of engaging some parents in understanding the value of their children's education.

Arrival in Nepal

The six-hour plus journey from Kathmandu in the jeep was hard going; the last 35 miles took over four hours as the roads are scarred by landslides. The skilled driver worked his way slowly round hairpin bends, driving steadily, and only exclaiming when we slid sideways on the steep mountain roads. I held the handrails so that when the Jeep bounced, I didn't hit my head on the frame: this I've learnt from hard experience!

Kamal and his family welcomed us in their customary way – with prayer scarves and black spicy tea. The warmth of the community was, as always, completely immersive, as the children gathered, raced around, laughed, made jokes, asked questions and rolled about excitedly.

The Great Science Share in action

Fresh in my mind when we arrived in October was finding a moment to show the children the film and make and test the paper helicopters. You never really know what's going to happen next in Nepal and so flexibility and spontaneity are great allies.

So, with the children gathered round and curious, I slipped the iPad (charged in advance in case there was a power cut) from my bag, to show them the film. The children watched, listened, chatted amongst themselves and were intrigued. Older children translated for the younger ones.

I pulled the paper, scissors and paper clips from my bag so that we could begin our experiment. The children

Nepal, how to simulate the spinning fall of seeds so that we could watch it together and carry out our own investigations. By this time I felt amply equipped, I downloaded the film onto my iPad and packed it along with paper and paper clips.

Preparation and context

Preparation for visiting the school in Nepal is always intense and begins months before I travel. Basic resources (electricity, transport, medical supplies), if there at all, are unstable and can be quite literally swept away with a heavy monsoon or landslide.

Vaccinations (including against rabies) need to be checked and scheduled. I always travel with antibiotics, electrolytes, antihistamines and water sterilisation tablets. Trekking shoes in my hand luggage are also a must. Transport breaking down or becoming stuck in rutted or impassable roads is a real possibility, so I want my worn-in shoes, not new ones. I'm always prepared to walk for two days back to Kathmandu. (All my luggage went missing the first time around and strategic hand luggage packing saw me through well!)

The village is remote and serviced by one overcrowded bus a day outside of the monsoon season. We always discuss practicalities at this school to ensure steady progress: funds, the challenge of moving equipment over the roads, the long monsoon and the height of the river isolating the village. The unmade roads, intermittent electricity and, at best, slow Internet are still major infrastructure challenges.

Some children at the school have high aspirations and tell me that they hope to be doctors, engineers and pilots. Other children struggle to attend school, as work on the family farm is the expected priority. Some parents aspire for their children to go

Helen, Rafik and the Headteacher Kamal united again in 2019

Science Share for Schools (GSSfS) to Nepal. I was curious about how this could work. There was still no science equipment at the school and we had planned to resource the science lab on a future trip once the new school was built. Another issue was likely to be the small luggage allowance left for our planned trip. I was already carrying 11 kilos of washable sanitary kits to distribute and I also had my sleeping bag, as I sleep in the family room at Kamal's house whilst I'm there.

'You do know I'm not a science teacher?' I remarked to Lynne. 'You don't need much – it can be as simple as some sheets of paper and paper clips!' she advised.

The idea

The idea was given as a challenge to secondary pupils at The Derby High School in Bury, who were immediately interested in supporting this idea. Taking on the problem of using only paper or basic resources, they created a film showing the children asking their science questions about seed dispersal using paper helicopter investigation

- How long do they take to reach the ground?
- What happens when it's windy?
- What about if it rains?

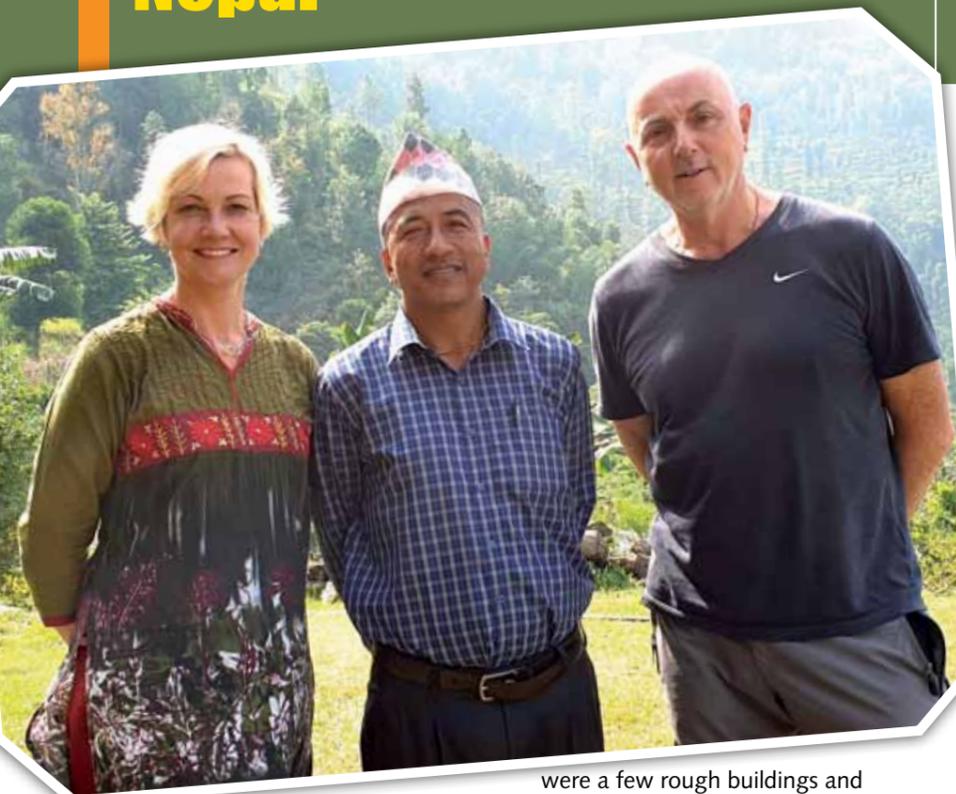
The Derby High pupils generated the ideas, created the script and made a film of their investigations. In the film they demonstrate, for the children in

were a few rough buildings and children who were keen to learn. There was no shortage of aspiration, but resources at the school were sparse. Then, two weeks later, the 2015 earthquake struck, leaving the school buildings damaged beyond repair.

Rebuilding Schools Nepal was established to develop a sustainable programme of education for the children in the five villages who could attend the school. Progress since then has brought fresh running water to the school, as well as toilets, washable sanitary kits, stationery, textbooks, backpacks for all the children, computers, large screens for group teaching, chess sets and cricket equipment!

Planning the trip – October 2019

In October 2019, Dr. Lynne Bianchi suggested that we take the Great



Working in Nepal is challenging on many levels: resources are limited, infrastructure is basic, and at any time there is the potential for all plans to be interrupted by natural disasters. Success requires great flexibility as well as an ability to put aside your assumptions and expectations. In this article, I reflect on the experience and review what was learned by both the children and adults when taking the Great Science Share to Nepal.

Background

I first visited Antarasriya Yuwa Barsa School and met Headteacher Kamal Bikram in 2015. The school had no running water, no toilets, no computers, no books, no stationery and no post-15 provision. All I found

Keywords: Collaboration ■ International ■ Networks ■ Curiosity ■ Creativity



Learning without limits – a hands-on practical experience generating excitement, enthusiasm and, most of all, lots of questions!

narrating the film. Brilliant!

For pupils here in England to know at an early age that they can make a positive impact on children on the other side of the world, share their science and open up windows of possibility to others was a new experience – a really great experience! I shared the footage that I brought back, which allowed them to see what they have made possible, and how it could be achieved. The project widened the horizons of children on both sides of the world.

What was the learning?

The GSSfS commitment to collaboration and inclusion is real.

Asking questions, experimenting, making discoveries, recording and sharing are transferable and meaningful to all children in all places. Being free to access and non-competitive facilitates genuine inclusivity. The full reach, potential and impact of the GSSfS are still unknown and it has the potential for so much more.

It's these lived values that enabled children in a remote village to join in when and where they could with a few bits of paper and paper clips – and all because a school in Bury caught the vision and were willing to share their science.

Working collaboratively towards school improvement



To find out more about Rebuilding Schools Nepal, visit:

<https://www.helenmgconsulting.com/rebuildingschoolsnepal> Watch The Derby High School film at:

https://www.youtube.com/watch?v=HBCQ8_UbgPs

Get and stay curious

Jim Collins, in *Good to Great* (Collins, 2001) talks about developing a culture of curiosity. Applying this to context as well as content helps with our investigative skills and enables appreciative enquiry into our own work, and the work of others.

Broadening our networks is one of the ways in which we continue to learn. Being exposed to different ideas, ways of seeing the world, questions, investigations and possibilities gives us a different lens through which to see the world. Importantly, it can also challenge our assumptions, curiosity and possibility being great allies of learning.

This matters as much for professionals as it does for children and young people. It's easy for us to narrow our networks to people like us, who do work like us, and think like us. We can seek out new networks and opportunities to collaborate beyond our usual sphere. Widening our networks in this way can create new and unexpected opportunities. Our teaching, consulting and facilitating skills are of course transferable. Even when working with the most basic equipment, outside of our subject area, across cultures and language, we can still ask questions, provoke curiosity and endeavour to explore and discover.

Thanks

Huge thanks to Dr. Lynne Bianchi from the University of Manchester, Lynn Provoost and Mark Lilleyman at The Derby High School and, of course, the children in Bury and Nepal for sharing your science.

Reference

Collins, J. (2001) *Good to Great*. London: Random House Publications

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From buds into blossoms – the stories of GSSfS growth in the West Midlands and Scotland

Kate Redhead in the West Midlands and Paul Tyler in Glasgow share their GSSfS journeys over the last four years



Children working together to explore liquids

Introduction

Describing the aims of the Great Science Share for Schools (GSSfS) has always been easy: bringing schools, teachers and science advocates together to collaborate and share their scientific questions in an engaging and inspiring way. However, explaining what a GSSfS looks like can be more tricky as it can take many different guises: the children may be from the same or a different school; it may be run during class time or as an enrichment event; it could be held in a classroom, a school hall, a university...the possibilities are endless, but essentially it is whatever works best for the individual school(s). At the core of any sharing event are the children themselves, asking and developing scientific questions of the world around them, answering them in a practical way and facilitating other children to explore in an inclusive and non-competitive way. As an 11 year-old child at a GSSfS in Birmingham last year said: 'It's a bit like a Science Fair, only loads better!'

The West Midlands experience!

In the West Midlands, the first Share was a 'toe in the water' collaboration by Clifton Primary's Science Network, where five schools each brought a small group of children together for an afternoon of sharing in the science lab. What was immediately clear was the children's confidence in facilitating their own practical approaches to answering questions; there were hardly

any teacher voices. Children from Year 2 (ages 7-8) to Year 6 (ages 10-11) were exploring together, which is the real impact of GSSfS – children leading science learning with each other, developing their confidence and exploring new areas of enquiry.

The focus of the GSSfS served to bring the schools closer together and, quite quickly, plans were made to build on the success of the first year. With a clearer understanding of the impact, there was a strong element of professional learning underpinning the collaboration. Teachers discussed how they could develop and improve children's understanding of good science questions, and many reported the improvement that this created in the use of questioning, both in their own classrooms and across school. The outcome was seven schools bringing more children to the Share, with one school hall used to host the event. Additional support was provided by Science Ambassadors from Wolverhampton University, as well as STEM Ambassadors.

Scaling up

The success of the 2018 GSSfS and the enthusiasm of the school cluster drove further growth. With me in role as a Primary Science Teaching Trust Regional Mentor, reaching out to other schools and organisations was timely. In 2019, the West Midlands was alive with GSSfS events, all drawing on the learning from the original group of schools:

- 10 schools holding a GSSfS at Birmingham City University (BCU), beginning with an aspirational talk in the lecture theatre before sharing in a large hall full of children, science museum ambassadors and University undergraduates.

- 10 schools in Coventry also ran a GSSfS at Coventry University involving PhD students collaborating with children to extract DNA from strawberries.

- 6 schools in Warwickshire attended an event run by the National Farmers Union Education team at Stoneleigh Park.

- 6 schools in Birmingham held their Share at Blakesley Hall, a Tudor House 4 miles outside the city centre.



Taste testing at the Coventry University Share

Keywords: Collaboration ■ Teacher and pupil confidence ■ Transition ■ Outreach ■ University engagement



BCU Student Ambassadors took an active role in the event

Birmingham Share hosted at BCU – ten primary schools working together to explore questions



These pictures are from 2019. At each of the events there were people (teachers, science ambassadors, education officers and many more) who were taking part with a view to running their own event in the future and, before the impact of lockdown, there were already eight Shares planned for 2020 in the West Midlands. The beauty is that each Share would have been (and hopefully will be in 2021) different from the next, each one being best fitting to those running the event and the children with whom they are working.

Glasgow takes on the GSSfs – from the family kitchen to school networks!

The very first GSSfs was launched in July 2016 to tie in with the European City of Science Festival. This was problematic, as Scottish schools had broken up for the summer holiday, but as I hate to miss out on anything I decided to take part at home, in the kitchen with my 3 year-old daughter. We had great fun making a mess with chemical reactions and my daughter exploring with a constant stream of 'Why?' questions. We tweeted our activities to share with everyone else and, from the range and amount of science shared that day, it was obvious that the GSSfs was going to grow and grow. I wanted Scottish schools to have the opportunity to get involved and, after a bit of persistent lobbying, the date was moved to fall in line with term time across the UK.

Mearns Primary School hosted the GSS conference in 2019



Why did we bother?

Science is always a priority at Mearns Primary School, so I had no problem persuading my Headteacher to let me run a GSSfs event in 2017. I gathered together a small group of pupils who I knew had a particular interest in science and they organised the event during their lunchtimes. In the two weeks building up to the GSSfs, they visited all 28 classes across the school to do a short presentation about the importance of questions in science. They invited each class to come up with a question to investigate and then present their findings to the school.

The creativity was brilliant – classes investigated bubble solutions, parachute materials, paper aeroplanes, cookie recipes, yeast rates of reaction, reaction times and a whole lot of

other things – all based on their own interests and questions. Each class made a poster and a 2-minute film to share their findings with the rest of the school.

As Scottish schools fall under Local Authority control and work in geographically close clusters with a high school partner, I saw this as the next area of progression for our GSSfs activity. Our cluster chose to have a joint GSSfs event at Mearns Primary, where 8 pupils from each of the 4 schools engaged in a Science & Engineering-themed day. The day was designed to show children the power of collaboration and the importance of basing science and engineering on well thought-out questions, and involved a local inventor who shared his career journey and gave the children an insight into how inventing works.

The children then worked in small groups on a series of engineering investigations, each based on questions they wanted to answer. They built bridges with lolly sticks and wire, towers out of cocktail sticks and midget gems and a pulley system with cotton reels and string, and we joined the Scottish Schools Education Research Centre's (SSERC) live GSSfs lesson to make O-wing gliders.

Widening the appeal

In 2019, my ambition was to give children an opportunity to share with an even wider audience. This saw my school host two GSSfs events. Both were organised and run by the science lab technicians in the school after some training on child-led approaches, and

Ideas for developing Great Science Share for Schools activities

Toe in the water	A little braver	Dive right in!
Run a classroom GSSfs over two afternoons: working in 2s or 3s, children develop and explore a question one afternoon, which they then share the next. Split the class in half and give each group time to be facilitators and delegates.	Run a year group or phase GSSfs: classes could visit each other's classrooms. Special guests (teachers/parents/governors) could be invited after school. Or run a lunchtime GSSfs, hosted in the school hall.	Invite other schools to GSSfs: this could be a small number of children e.g. 8 pupils and 2 teachers or a whole year group. Consider inviting 'real' scientists to share; this could be parents or local STEM Ambassadors.



Children extracting DNA from strawberries

they were very excited to have the opportunity to take part in the GSSfs.

The Primary Science Conference involved:

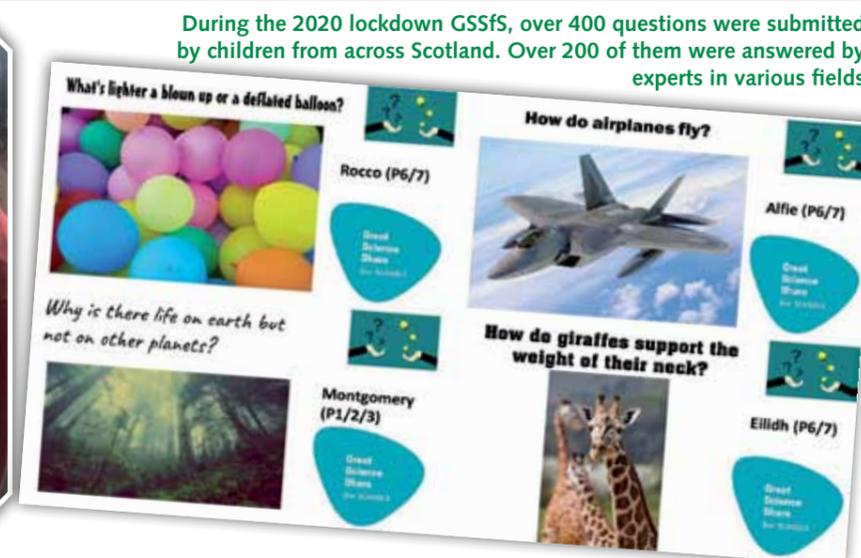
- 96 children from 12 different schools;
- a full morning of science;
- a keynote speech about the importance of science and the work of scientists;
- a showcase of children's science questions and investigations; and
- a choice of practical workshops, run by the lab technicians, based on hydraulics, chromatography, rocket building, surface tension and meteorites.

The Early Years Outdoor Science Festival involved:

- 70 nursery children from 10 different providers; and
- the opportunity to explore minibeasts, sound and bubbles through hands-on activities and asking questions.

Overcoming lockdown the GSSfs way!

We had all planned to run a GSSfs Science Festival at a high school for children across the Local Authority. When it became obvious that lockdown couldn't let this happen,



During the 2020 lockdown GSSfs, over 400 questions were submitted by children from across Scotland. Over 200 of them were answered by experts in various fields

we moved everything online and created a full day of activities for the children. Hosted in three Google Classrooms (Infants, Middle School and Upper Primary), we had over 1000 children from all over Scotland engaging over a two-week period, and over 900 involved in our GSSfs day activities. Linking in with the national programme resources, children were invited to ask questions in the two weeks building up to June 16th and these were collated and sent out to experts from around the world, or shared on Twitter, to answer. In total, over 400 questions were submitted and over 200 were answered and shared back with the children. On June 16th we joined in with the GSSfs live lessons and #AskAQuestion throughout the day, as well as having a few additional debates and opportunities for children to share the science that they had been doing at home.

It was a huge success and I think that we have found a platform and format that we will be able to use again moving forward. The online event allowed us to engage children from across Scotland, which would otherwise not be possible. It also allowed opportunities for children to share their ideas and questions, comment on each other's, discuss and debate in a safe and supportive

environment. The opportunity for nationwide collaboration and sharing is something that we will explore for next year's GSS event.

Some ideas if you're just starting out

In both Scotland and the West Midlands, it has been a really exciting journey building year on year on the successes of the previous event and looking for ways to increase the reach and opportunities for children to take the lead. Our main advice would be to start where you feel most comfortable... small is still great! Start with your class or across your school, see what works and then look outwards for opportunities to collaborate and share with other schools, and organisations, in your area.

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So what's GREAT about being an engineer?

Sarah Longshaw and Charlotte Smailes discuss how an ENTHUSE Partnership (a cross-phase collaboration between schools and industry) engaged pupils in a Great Science Share promoting careers in engineering



Pupils from Whitehill Primary School, Stockport, demonstrating what might help an egg to float

Most adults might struggle to answer the question 'What's great about being an engineer?' and yet, fundamentally, engineers solve problems. This involves identifying the problem, creating and testing possible solutions, adapting these and continuing until a satisfactory solution has been found. In this way, engineering is not that different from science – and yet, how many primary pupils have an understanding of it or see themselves as future engineers? Furthermore, of those who might, how many are female or from less privileged or BAME (Black, Asian, Minority Ethnic) backgrounds?

This was the starting point for the ENTHUSE partnership sponsored by industry partner, Worley, a global

engineering company focused on energy, chemicals and resources, with offices in Cheshire. Worley entered into a partnership with schools (6 primary and 1 secondary) in Stockport, to encourage more people from under-represented groups to know about engineering as a career, with the intention that this would lead to more students considering engineering for their future.

Engineering in the English National Curriculum

Although engineering is not explicitly part of the primary curriculum, the specific skills that it requires point directly towards the discipline. Most primary science teachers and leaders would agree that STEM subjects lend themselves most appropriately to the development of the skills that underpin engineering, such as fostering independent thinking rooted in resilience, perseverance and self-led investigation. We want the children to be hands-on and to experience safe failure.

The fact is that, in England, engineering does not appear on the timetable in primary or secondary schools; however, engineering skills are evident and often taught and explored in extra-curricular STEM Clubs, through investigations, demonstrations and experiments.

What happened?

The school and industry partnership was supported by an educational coach, Sarah, whose role was to support the primary Science Subject Lead teachers and the secondary school teacher through the project. Together they determined how engineering career awareness could be strengthened.

A Great Science Share was chosen as the best possible solution to allow the mixed age phases to work together. Having a science fair-type event meant that the planned investigative activities could be carried out either as part of science lessons or during a science club.

Worley were keen to elicit the attitudes of 9-10 year-old pupils (particularly focusing on female, BAME and pupils allocated Pupil Premium funding) towards engagement with science. They offered schools the opportunity to apply for assistance from an ambassador from their company to support the fair, thereby being able to talk about and promote careers in science and engineering, helping children to make links between where their interests in science were and how that could link to careers in engineering. Unfortunately, due to lockdown, the data have not yet been collated, although this will be a priority once the project resumes when school re-starts in September (it's a two-year engagement).

At first the teachers were a little unsure about what the focus of their clubs/lessons might be. Starting with questions, Sarah encouraged the teachers to talk openly to explore 'What could we do with a plastic bottle?' Teachers readily considered making lava lamps, modelling the lungs, making a bubble blower, a rain gauge and using the bottle to contain the reaction mixture of vinegar and bicarbonate of soda, and followed up a similar line of questioning with their pupils in school.

The Great Science Share day

Building on the enthusiasm of the Great Science Share for Schools (GSSfs) campaign, which repeatedly promotes how, if you start with a question that the children are interested in, then they will drive the investigation, the Great Science Share took place in British Science Week (March 2020).

The Science Fair at St Anne's Roman Catholic High School, Stockport, featured two entire secondary year groups and more than 60 pupils from 6 different primary schools – accompanied by teachers and three Worley ambassadors. Pupils shared science investigations that ranged from those inspired by the desire to reduce our use of plastic, to other STEM-Club favourites such as 'What colour is black ink?', 'Which egg will float?', and 'How do you get the highest stream of liquid with coke and Mentos?'. Pupils contributed to displays, models and hands-on experiments, with plenty of willing volunteers explaining what their investigation was about, why they had chosen it, what they had learned and the skills they had developed as part of the process.

What difference did it make?

When asked about the impact of running and taking part in the Great Science Share, teachers made the following observations:

- they all felt that the pupils had increased their science knowledge and enquiry skills;
- pupils had also developed skills such as resilience, communication, working with others, independence, research and engineering skills; and
- Cale Green Primary School had specifically targeted a group of the girls who spoke English as a second language and who had previously shown limited engagement in science. They reported how delighted they were with the development and enthusiasm that resulted, as well as the success shown by the pupils in explaining their projects.

The Enthuse Partnership is a two-year project. We wanted to incorporate a science fair early on – so the initial involvement with industry included a meeting between teachers and Worley graduate engineers to understand the influence of role models on their future careers. Some of the schools worked more closely with an allocated engineer who supported them with their projects. The plan is to extend this aspect next year. Different schools chose different activities – some with a more engineering bias than others: St Joseph's, Reddish chose to make propeller-powered model boats and balloon-propelled model cars, designing their model, producing a prototype and refining to get a working model. Whatever

Pupils taking on the role of detectives in determining 'Who wrote the note?'

the project, what was important was the 'try fail learn repeat' attitude that pupils developed towards answering their particular question.

The Lark Hill Primary School experience

After meeting with other schools in the project, Charlotte (Science Subject Leader at Lark Hill Primary School, Edgeley) began brainstorming what they could do with a plastic bottle. Themes of environmentalism were discussed alongside the children's dreams of building things they had only seen on YouTube.

In the Club each week, the group constructed objects made out of plastic bottles: cars, volcanoes and marble runs. Their questioning led them to tinkering – whereby they asked themselves how they could make something faster, stronger, more secure or more explosive.

Eventually, the Club settled on a showpiece for the Great Science Share that they believed would excite new audiences the most. They experimented with different numbers of Mentos being dropped into different volumes of Diet Coke and refined the amounts. The children coupled this idea with their two favourite marble runs to allow for an interactive stand at the Science Fair.

On the day, children from Lark Hill were able to meet and engage with a range of primary and secondary children, all with the intention of sharing what part of science and engineering they were most passionate about. Every child was inspired by other projects they had seen and conversations they had with other pupils.

Back in school, children kept the buzz alive by explaining to their friends the day they had experienced. Soon after, there was a waiting list for STEM Club.

An external evaluation of ENTHUSE partnerships in 2017 reported 'a positive impact on pupils' outcomes, both in terms of academic attainment but especially in relation to pupil engagement and enjoyment of STEM subjects', which is certainly our experience as evidenced in our



Pupils from Cale Green share some of the activities that they most enjoyed at their science club sessions

GSSfs. We would like to think that, by engaging the teachers too, we have a more lasting impact since they share their enthusiasm and understanding with each new class that they teach.

Reference

ENTHUSE Partnerships external evaluation and impact report by Curee (2017) (www.stem.org.uk/resources/elibrary/resource/417168/enthuse-partnership-impact-report-2017)

Sarah Longshaw has over 20 years of teaching experience and leads the Science Learning Partnership for Cheshire & the Wirral. She is an active member of ASE, a Chartered Science Teacher and ASE Field Officer for the North.

E-mail: sarah.longshaw@ase.org.uk
Charlotte Smailes is a Key Stage 2 teacher and the Science Leader for Lark Hill Primary School in Edgeley, Stockport. Her extra-curricular STEM Club had an open invitation for children from Years 3 to 6 (ages 8-11). In this project, her role was to guide the children through the process of engineering using plastic bottles and to bring pupils to a new, bigger audience.

Keywords: Industry engagement ■ STEM Club ■ Community partnership ■ Cross-phase

A community affair – the Bridlington way!

Lynne Bianchi talks to Kate Sutton about how she inspired a Bridlington primary science community through involvement in the Great Science Share for Schools (GSSfS)



Sharing together

What first motivated you to get involved in the GSSfS?

Participation at school has built over the years. At my school, Burlington Primary, we also wanted to change the misconceptions that science was an explicit lesson each week about making potions, and that all important scientists were old white men who are now dead! So, in 2018, our first year of involvement, the children 'Drew a Scientist', which was very enlightening – many drew gendered depictions of male stereotypical images of scientists. The pupils subsequently learned about different scientists, both men and women, and also started to understand about the wide range of STEM careers available to both males and females. They started, in a small way, to tackle

engrained gender/stereotyping issues and they investigated their own ideas about scientists and STEM jobs that interested them.

One of the principles I have tried to encourage in the school is that science is everywhere and we are all living science. I aimed to ensure that the children had opportunities to access a variety of contemporary professionals, including Bonnie Posselt (RAF doctor in Aviation and Space Medicine), John Shepherd (musician) and Dr. Carl Steele (Technology Manager at

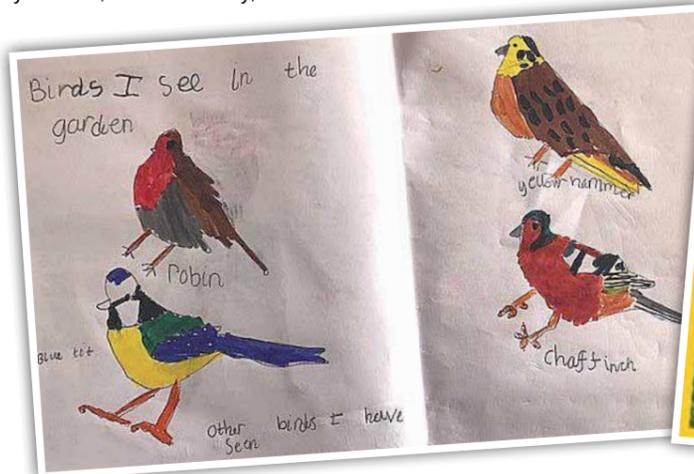
A festival of flowers

Close observation of the world around us!

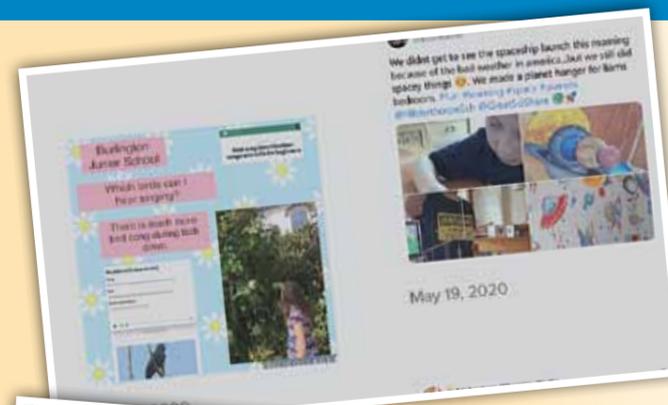
Sellafield). I wanted them to see that science is NOW and this led me into wanting to grow the profile of science and join in with the GSSfS.

What impact has the GSSfS had on science learning in your school?

The greatest impact is that it has supported science being seen as



Keywords: Community ■ Social media ■ Family engagement ■ Science share



Pupils sharing science using Twitter made their GSSfS experience real and responsive



carried on across the academic year; they were filming for this during Science Club, which they had planned and intended to share in a wider way online when lockdown hit.

Can you tell us about taking the GSSfS beyond your school?

In 2020, I decided to focus on developing more of a primary science community across Bridlington and initially planned to put together a collective GSSfS event, where pupils from many Bridlington primary schools could interact. The children had already enjoyed making and developing links with Bridlington School and also Hilderthorpe Primary (through our STEM Enthuse Partnership involvement) and wanted to share more with friends and peers. Our plans had to change once COVID-19 hit, but that hasn't stopped us!

I took part in meetings via Zoom with the GSSfS team whilst working from home and communicated with many science subject leaders across Bridlington via e-mail with information about the GSSfS. I was so excited to see how many engaged and started to see ideas and plans coming together. Due to the fact that children were working from home, the GSSfS became an event that spanned weeks, linking with the weekly themes and combining lockdown activities developed with families at home that involved nature, daily exercise and curiosity.

Resources we used to inspire children to share science!

- Explorify challenges
- School science units of work that focused on animals, including humans (the circulatory system, health and the effects of exercise), plus Living things and their Habitats for Year 6 (age 11)
- GSSfS Weekly Themes, such as the Scavenger Hunt and other challenges such as those tweeted by Dr. Alison Buxton and Maker Futures
- GSSfS Question Makers – in particular, Questions Hands!

Although it did not go as we initially envisaged, we have certainly established stronger links with other schools, which will support future development of our work and the GSSfS.

Why is developing a community for science so important to you?

Developing a sense of community is so important in all areas of education, with the ultimate hope that it may enable children to hone key transferable skills such as collaboration, resilience and determination. As they progress towards their future selves through education, it is vital that learners are supported to undertake their learning journey in the most effective way and to maximise their learning. It would be brilliant to see their prospects enhanced through participation in such events at this younger age.

The togetherness was enhanced online through engagement with social media such as Twitter and the use of the #Bridlington hashtag. The Science Showcase on the GSSfS website was a welcome way for the schools to see their own work, and that of other schools and families across Bridlington. The range of work and the innovative way it was presented was encouraging, interesting and engaging. It would be such a positive to share best practice across this group of schools and enhance relationships further in the future, without the limitations of lockdown, of course!

How necessary was social media for your community growth?

Twitter is a great way to engage and it definitely supported us, and the website showcases, this year. It helped



What have the other teachers said about the impact in their schools?

Brandesburton Primary School's Great Science Share!

Karen Platten, Science Lead, shares her experience of the GSSfs:

I was made aware of the Great Science Share and was excited to take part. Due to the pandemic, it really suited our school's plan for using class home-learning blogs; in particular, the International Dawn Chorus theme relating to birds fitted really well with our Key Stage 1 (ages 5-7) theme. This aimed to get pupils out in their gardens and observing nature.

By far the most popular weekly theme was the 'World Oceans Day', which really caught the children's imagination and led to lots of pupils submitting their work electronically to their teachers so that we could submit it to the showcase. We were all excited to exhibit work from our school on the showcase and were delighted to be featured as 'school of day' at one point. We were able to make strong links to the science curriculum, such as Year 3 (age 8) 'Plants', 'All Living Things' in Years 4, 5 and 6 (ages 9-11), and also to working scientifically across the primary age range. It has been a very engaging experience for our pupils, especially during such difficult times, and helped to promote science in a fun way, which is just what was needed.



The GSSfs Question Makers supported pupils to ask questions

us to share in a broader way and allowed pupils at home or in school to have their work, ideas, activities or investigations shared. It was great to see people commenting, interacting and retweeting, therefore sharing, again in a wider way.

The immediacy of online and social media is a real advantage – allowing ideas to be shared quickly. For instance, the Question Makers on the GSSfs website are great for encouragement and engagement. After I tweeted the children's work, a teacher from another school commented about it to one of their colleagues, suggesting they should use the strategy across the curriculum at their school, and so the sharing goes on!

A surprising and really pleasing outcome, which added great excitement, was making connections within the community with families whose children attend other schools

in our area. Liam and Ollie (@NatureRambles) are part of an amazing family who live in rural East Yorkshire and enjoy what really seems like an idyllic time living and learning through nature. They attend one of the Bridlington schools and it was an utter privilege to see and share their adventures and to continue to do so. Nature is a wonderful thing, which sometimes feels lost on some human beings – not so with these boys. Thank you for sharing and supporting – I am inspired!

What I do see going forward is that, even when we are able to be physically together for a GSSfs event, using online and social media means of support adds another layer of depth to what we are doing.

What other things made this year's Great Science Share different for you?

Lockdown put a whole new spin on the GSSfs and we used Class Dojo as one means of communication with my Year 6 class, as well as the whole school. A number of pupils enjoyed taking part using the weekly GSSfs themes and posted their work and photos in the shared areas. These were shared across the school via Dojo, Twitter and the GSSfs Showcase page.

The increased engagement in nature, cookery, tinkering for learning, exercise and mindfulness at home became evident as 'home working' was shared – a lovely thing to witness

as an unexpected outcome of the pandemic. The SpaceX launch also enthused many pupils to get in contact and engage with science. We have a great link with Farmer Time, with Farmer Tom and our Farmer Colin, where the children loved to ask and see their own questions answered – they felt like VIPs in a much wider science community.

What are your next steps?

I am so happy with what was achieved this year during the GSSfs, particularly during a time of huge uncertainty, and proud to say that we've achieved a new way of working across schools. These relationships will be nurtured into the next academic year and we are looking forward to being able to build on that for GSSfs 2021 with, hopefully, an actual physical event in which the pupils from across Bridlington can participate together. Going forward, I'd like to continue to explore the focus on science careers and also the links with real-life themes, enabling children to develop their investigative, collaborative and making skills, as well as thoughtfulness as they develop their science capital, knowledge and community for the future.

Kate Sutton is the Science Subject Leader at Burlington C&E Primary School and a Primary Science Quality Mark Hub Leader.

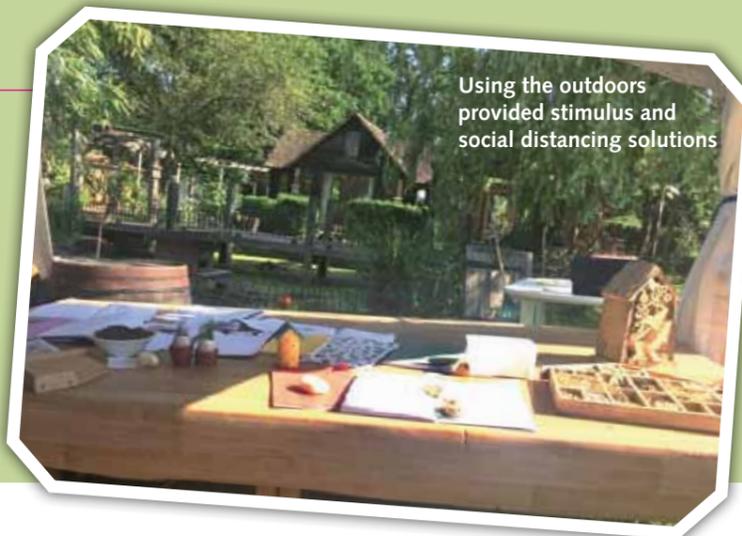
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Great Science Sharing – a home school story!

Martin Hollins, retired science teacher, has supported children to share their science as part of their home school in Surrey!



Using the outdoors provided stimulus and social distancing solutions

I am a retired teacher living in the Surrey Hills, alongside several families who opt to home school their children. I regularly teach science to several age groups and have taken part in the Great Science Share for a number of years. When the 2020 lockdown hit, it seemed like an ideal opportunity to take part in the Great Science Share again to let the children take the initiative in choosing what to study and what to share.

The context and setting

The families all live in an 'estate' of about five acres, the remnants of a farm estate, in old, restored or new buildings on the site, which is heritage listed – there are not many farms left in Surrey! We are adjacent to Bookham Common, which is a diverse habitat managed by the National Trust.

The estate grounds include several individual gardens, a playing field, an allotment, an orchard, and a courtyard – the old farmyard, surrounded by barns and homes. The local 'terroir' is the spring line, where the chalk and limestone of the North Downs gives way to the clay of the Thames basin. I say 'terroir', as we have one of England's largest vineyards just down the road.

The children come from five families and each group has members from several families:

- 4-6 year-olds: three girls and a boy
- 7-10 year-olds: four girls and three boys
- 10+ year-olds: three boys aged 10-13, and an adult woman with special educational needs

Springtime had arrived by early April and we were in a nature-rich environment, therefore I simply asked the children to choose to study some aspect of natural life on the farm site. Due to the social distancing measures in place, I would meet them outdoors once a week to see how their work was progressing and they were also encouraged to involve their parents in the activities. Several of the children chose to make something and I advised them that that was fine, but they needed to accompany this with scientific observations. I suggested that these might be prompted by a hypothesis and result in explanations and conclusions, towards a presentation that they would share with all the home schoolers.

Children's science share activities

We had been doing some environmental study, which led to the boys wanting to build something such as an insect house or a bird feeder. Most of the girls wanted to make models of living things. Our first discussions focused on how their constructions would lead to them finding out more about local nature. We talked about this being used to inform observations, so it was more than the 'make' itself. With the insect houses and bird feeders, the children considered how the construction could attract insects and birds and they thought about the different



Bug hotels were of great interest to explore living things

Keywords: Home schooling ■ Outdoors ■ Cross-curricular ■ Science communication



A festival of Twitter shares!

were'n't allowing them (most of the time) to investigate by themselves. In my opinion, the children were being guided too much.

I discussed how to raise the profile of science at home and decided, along with the rest of the staff, that we would do a showcase to parents modelling how to engage children more in independent science learning.

175 (44%) parents attended and I spoke about using the questions that the children had generated during our lessons this year, modelling to parents how, as a school, we allow the children to investigate without giving them the answers. We had worked really hard to move away from science investigations that were 'WOW' lessons and wanted to ensure that children were gaining knowledge from investigations that we carried out. The children were now asking more meaningful questions, investigating these questions and explaining what they had found. Every year group was following this structure. I also decided that I wanted the children to lead these sessions – and thus our Great Science Share idea was born. Now we just needed to execute it!

Great Science Sharing

For our first Great Science Share, we took on the campaign's value of being more collaborative and invited the parents into school to take part in open lessons. This meant that the parents watched our lessons and supported their children with their work. We had

some great feedback and they loved how practical the sessions were. They were also impressed with how we listened to the children's questions and how our lessons changed depending on what the children's interests were.

In the next Great Science Share, we wanted to develop the campaign value of being child-focused and having the children take more ownership over the questions they asked and investigated. The parents were invited in again but, this time, the teachers didn't lead the lessons. The children showed their parents what they had

Year 6 Darwin investigation



learned. In Year 6 (ages 10-11), they designed the activities and delivered them independently; in Year 1 (ages 5-6), the teachers asked the children to vote on their favourite activity that year, and then the children worked in groups with their parents and an adult. The children led the explanations.

Year 6 Great Science Share experience

In the autumn term, our topic was 'Animals, including humans', and in spring it had been 'Evolution and Inheritance'. The children had absolutely loved these topics and gained so much understanding through the investigations that we set up. They were really excited to share their knowledge with their parents. They came up with 5 of their favourite investigations from the year and thought about how they would teach their parents. They chose: making blood (researching the different parts of blood and making it with sweets and juice); playing a game based on the circulatory system (they became the blood travelling through the arteries and being oxidised); the evolutionary beak (based on Darwin's theory of evolution on the Galapagos Islands); a yeast experiment (investigating what effect sugar and water have on yeast); and then, for fun, they taught their parents how to make slime.



How does the water temperature affect the Skittles colour change?

Across the school, each year group worked with their classes to share their science from the year with them. In Year 5 (ages 9-10), they looked at how to separate materials, Year 4 (ages 8-9) looked at chromatography, Year 3 (ages 7-8) investigated how light travels, Year 2 (ages 6-7) looked at floating and sinking and Year 1 (ages 5-6) worked with the children to find the best material for the Little Pigs' house. Finally, the Early Years Foundation Stage (EYFS) children planted seeds and made healthy sandwiches.

Parental impact

After each Challenge or Great Science Share we have asked the parents for their feedback. It's always been really important for me to see how effective these sessions were felt to be. After the first Great Science Share, our feedback focused on how lovely it was for them to see what the children were doing, their classroom routines, and they enjoyed spending time with their children. When the children led the Science Share, the parents' feedback was even more amazing. They commented on the children's knowledge of the subjects and were surprised at the standard at which the children were working. They also shared that it made them feel that science isn't boring! They loved how engaged their children were.

Parent responses to the GSSfs experience:

What did you enjoy?

- Having my child showing me the experiments and sharing her knowledge
- Getting to know what the children are learning and seeing them enjoying it too
- Watching my daughter participate in experiments
- Learning what my son is being taught
- The evolutionary beak – trying to pick up beans/pasta

What did you learn?

- That no colours can be seen in the pitch dark
- How the children put into practice theory-based knowledge
- How much my child's knowledge has developed this year
- That science is not boring!!
- That the children learn at a higher level than I expected
- If the birds don't have the correct beak size, they would starve and die

Building on success

For 2020, I had planned to spread our wings a bit further and share our science, not only with our parents but also with the other schools within our Multi-Academy Trust. I wanted to use our digital devices (iPads and ICT platform, *Just 2 Easy* (J2E)) to share what we were doing with children in the same year groups. Our original plan had been for the children to find an investigation that they enjoyed and film themselves carrying it out. Although this didn't happen due to COVID-19, something even more amazing happened instead!

We moved our teaching and learning onto J2E, a programme that we have used as a school for a number of years. We use this programme to teach, coding, animation, word skills, green screen, etc. The children are taught to use it from ages 3 to 11, so they have a good understanding of how it works. As we started to set our children

work from home, I began to create and gather science investigations that children could complete with their parents. They all went into a folder on J2E and this was shared with the parents.

Our Digital Great Science Share 2020 experience

- Parents regularly shared the science that children had undertaken through videos and photos, using Twitter or on J2E.
- Each year group teacher offered their classes ideas of different investigations that they could do on the GSS day.
- Teachers offered live lessons to their children as part of home learning provision.
- Children engaged in daily tasks, working with their parents to investigate a question in which they were interested.
- Children presented their question and investigation to their class members via a live class science fair at the end of the week.

Teachers reported how many videos and photographs of investigations

were shared and how amazing they were. The children were able to speak about their findings confidently and had time to really focus on the results and conclusions.

Momentum and legacy

As a school, we've continued to engage with our families and children using social media and our ICT platform. It has helped that the staff at our school are as passionate about sharing their questions with the children as I am. We've seen so much benefit in linking our ICT to science, and facilities like the school weather station are now being more readily used by the whole school and there are links to the data about rainfall or wind speed that come in constantly, making science more meaningful and relevant. This has provided more links to maths, with graphs and research comparing weather in different countries.

Parental engagement is still something that we are working on as we return to school in September but, as a staff, we are more confident in engaging parents in different ways. If I were to summarise the aspects that mattered the most, I'd suggest

setting termly Science Challenges for families to complete during the holidays, inviting parents in for Science Week or working towards a Science Fair to showcase work done with the children in lessons. Regularly sending home examples of work that the children are doing in science (we use *Marvellous Me*) has really helped the parents find out what the children are doing in lessons and, in most cases, they have continued investigations at home, after the lessons. Finally, keeping the parents in the loop has really helped us to improve engagement, our school Twitter is used by all staff and parents to share our science, and we also have termly science newsletters that celebrate work that the children have done at school and at home.

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Where science and sharing are celebrated

Do you remember a time when you made a discovery and experienced a feeling of awe and wonder? Do you remember the first time that you saw a ladybird open its wing case and fly away, leaving you with more questions than answers? Did you try to follow it? Did you wonder how it had folded its wings so neatly and tucked them away out of sight? I'm sure you looked at them with more interest from that moment. We all know how rewarding it is to make a discovery yourself rather than being told by a grown-up!

At the Great Science Share for Schools, we believe that child-centred learning can make a profound difference for learners and educators alike. Our aim through this campaign is to raise the profile of science, at primary age, by enabling young people to lead, choose and be at the forefront of their own scientific investigations. We want them to want to 'do more science'!

Every year, we collaborate with an inspiring community from every discipline of science – cutting-edge scientists, researchers, artists and educators from around the UK (and the world!). Our common aim is to develop a passion for science in young people through the excitement of sharing their own questions and

investigations. As you will have seen in the articles within this journal, we achieve this by sharing the campaign with educators and parents, equipping them with a means of putting science at the forefront of their teaching. We also share resources, inspiration and ideas for their young learners. The campaign culminates in June every year with a day for young people to share their investigations and questions with new audiences.

We have gained real satisfaction from seeing the number of young people engaged with the campaign grow over the years. In 2020, we weren't able to attend any events in person, so it was fantastic to gain an insight into all of the science being shared the only way we could, via

social media and the photos and forms that participants uploaded. Thank you for sharing!

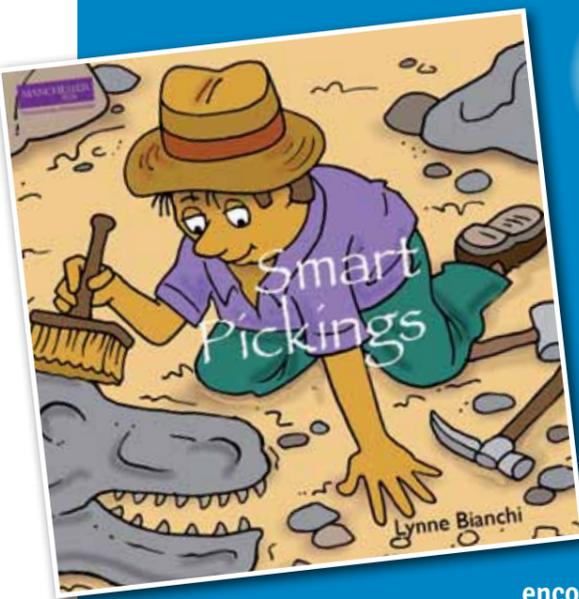
In the years to come, we hope to see even more young people getting involved and sharing their scientific questions – and we need you to enable this. So please join us for the next Great Science Share for Schools: we're sure you will not regret it!

.....

Steph Hepworth,
 National Campaign Manager,
 Great Science Share for Schools

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Price
£10.00

Smart Pickings

Written by Lynne Bianchi, this wonderful book for learners aged 3+ brings science into young people's lives in an immersive and imaginative way.

Using pictures and cartoons, the book introduces children to a range of scientists – new and old, encouraging them to explore their work and ask 'Who are they?', 'What are they famous for?', 'How did they make a difference?'. By selecting a science career, they can then enjoy considering what they could be and how they might follow in the footsteps of others to be the people who improve our world in the future.

Published by Millgate House Education and available from www.ase.org.uk/bookshop/smart-pickings-0

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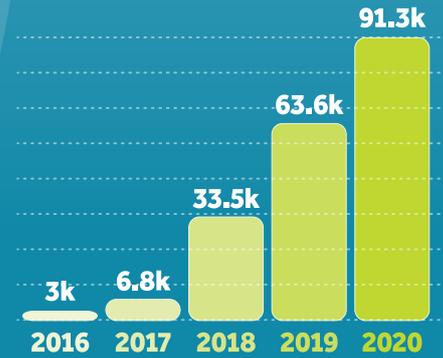
CREST AWARDS

Great Science Share 2020 in numbers

91k+

young people engaged in 2020

50k+
post
lockdown



Who took part?



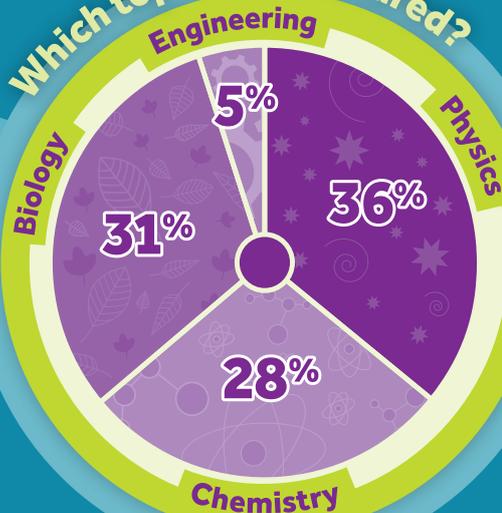
Participants in 14 countries

How does water get up into the leaves of trees when gravity pulls everything down?

Do all daisies have the same number of petals?

Australia, Belgium, Canada, India, Ireland, Nepal, Norway, Rwanda, Singapore, Thailand, United Arab Emirates, United Kingdom and Channel Islands, United States of America, Western Samoa.

Which topics were shared?



Teacher Confidence
93%

How can we stop bubbles popping?

Great Science Share
for SCHOOLS



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