

# primary (stem LEARNING

## Beyond the Partnership

How an ENTHUSE Partnership sparked a unique approach to primary science



14) The value of tinkering  
Engineering through making

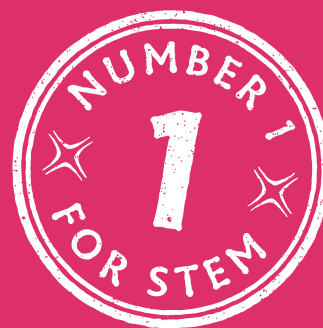
10) Teaching at greater depth  
Computing and mathematics

18) High quality CPD  
Local, national and online



# Welcome

Happy New Year – and what a year 2018 is set to be for teachers of STEM subjects!



The Year of Engineering is officially underway and what better way to engage your pupils than through the many inspiring activities on offer – from food production and energy to transport and culture. It has never been a better time to be an engineer.

The challenge to inspire the next generation of engineers creates a great opportunity to reflect and evaluate our own perceptions of engineers and how we convey this to our pupils. How we go about diversifying a workforce that is around 90% white and male really is in our hands, as we all have the privileged role of providing children with opportunities to explore the wide range of careers on offer.

In this new edition you'll find a host of exciting activities and opportunities to help your Year of Engineering get off to a great start – from working in partnership with local STEM Ambassadors to increase your own knowledge of careers in STEM, undertaking a STEM Insight placement with a local engineering employer or embedding new and exciting resources into your lessons.

The start of 2018 is also a great opportunity to let you know how proud we are to be your number one organisation for STEM support. We now support over 20,000 teachers of STEM subjects, impacting more than 2 million young people throughout the UK. We are able to do this by providing ENTHUSE bursaries to heavily subsidise many of our residential courses so that they are of little or no cost to you and your school. Whatever you are looking for to inspire your pupils and invigorate your lessons, we are your number one for STEM. Come and talk to us at the Association for Science Education conference and BETT Show 2018 to find out more.



I wish you a great start to the year and look forward to joining you in inspiring the next generation.

*Fran.*

FRAN DAINTY, HEAD OF CONTENT AND STEM EXPERTISE, STEM LEARNING

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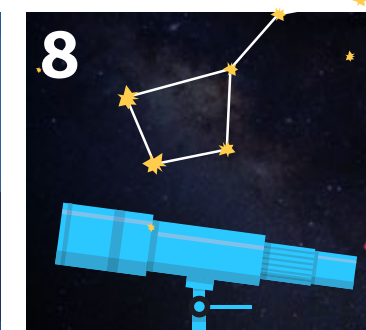
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# Evolve your teaching of evolution and inheritance

by **KAREN BRUNYEE** Primary STEM Subject Expert, STEM Learning  
@TravellingKaren



Monday 12 February is International Darwin Day and a great opportunity to discuss his work in helping to describe the process of evolution and natural selection.



So many misconceptions surround this area so the best thing to do is to keep things simple and work with animals and situations the children in your class are familiar with. Lots of pictures and visual prompts are great ways to get the children engaged in discussion and identifying variation in species.

Perhaps start by getting the class to name as many different animals as they can in a one minute. Look at the list and see if there are any similar animals. There might be a lion and a cat. Show the children pictures of a variety of animals; small, large and peculiar (my class adopted a blobfish as the class mascot!). Ask the question: why are different animals different?

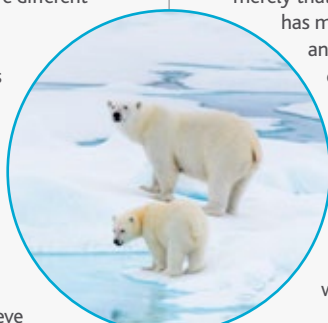
To allow the children opportunities to understand variation in a species, let them look at themselves as a population. What is the same about all the children in the class? What might be different? Eye colour? Hair colour? Height?

A lovely activity that Professor Steve Jones did with a class was where he collected snails, enough for each child, and they looked at differences and similarities within the population. What do snails have in common with ourselves? It is easy to say what is different but a little more tricky to identify similarities.

Children could look at photos of animals with their offspring and identify that they are similar to their parents but not identical. Puppies may have brown fur with black spots when a parent is just brown. Does this help the puppy in any way? Confer an advantage? Not really. However, a baby gecko whose feet were stickier than its parent's would find it easier to climb a tree and therefore reach more vegetation. This might increase its chances of survival and make it more likely to reach the age of reproduction. This is what Darwin classed as survival of the fittest. A really fun activity to cement this idea is the Bird Beak Buffet (see links).

It is important to talk with the children about adaptation being a long process and that it is not possible in one generation. It is also not that the animal or plant chooses an adaptation; merely that the mutation that has occurred has made it more likely to survive and therefore pass this on to their offspring. A polar bear did not develop white fur to live in the Arctic, rather bears with lighter fur were able to survive further north than their brown furred relatives. These bears survived longer in the snowy landscape and passed their white fur on to their offspring.

Lots of discussion, looking at evidence through photos and exploring some of the practical activities included with this article, will help children to avoid some of the misconceptions that are associated with this area of learning.



## COMMON MISCONCEPTIONS THAT CHILDREN CAN HOLD ABOUT EVOLUTION AND INHERITANCE

**1** Organisms can adapt in response to their environment and pass these adaptations on to their offspring.  
False. Zebras did not develop stripes to evade their predators, however animals that were stripy were able to better blend with their environment and survive to breeding age.

**2** Plants change to suit the environment - a cactus has developed pin-like leaves because it is hot.  
False. Plants that had smaller leaves, thereby reducing water loss through leaves, were better able to cope with extremes in temperature and therefore were more likely to survive where water was scarce.

**3** Giraffes have long necks because they stretched them to reach higher leaves.  
False. This is a very contentious issue amongst biologists. They agree they didn't stretch their necks but whether it was due to longer necked individuals' ability to reach more leaves or due to sexual selection and ability to use longer necks as fighting tools has not yet been concluded.

## EVOLVE WITH OUR CPD >

Developing excellence in upper KS2 science and mathematics  
[www.stem.org.uk/ny057](http://www.stem.org.uk/ny057)

Embedding working scientifically in the primary curriculum  
[www.stem.org.uk/ny030](http://www.stem.org.uk/ny030)

Creating a buzz and raising the profile of science  
[www.stem.org.uk/rp117](http://www.stem.org.uk/rp117)

## ADDITIONAL SUPPORT WITH OUR RESOURCES >

Professor Steve Jones: variation, evolution and inheritance  
[www.stem.org.uk/rx33k7](http://www.stem.org.uk/rx33k7)

Adaptation of seeds and fruits: Bird Beak Buffet  
[www.stem.org.uk/rx32w3](http://www.stem.org.uk/rx32w3)

Evolution of animals  
[www.stem.org.uk/cx65w](http://www.stem.org.uk/cx65w)

# Sailing ahead: the Polar Explorer programme

Bryony Turford (@priscigeeks) is a Polar Ambassador, visiting schools to support them to develop their teaching of STEM subjects as part of the Polar Explorer programme.

## HOW DID YOU HEAR ABOUT THE POLAR EXPLORER PROGRAMME?

I was previously a Space Ambassador and was approached at the end of the Tim Peake Primary Project to become a Polar Ambassador. I jumped at the chance.

## WHAT MOTIVATED YOU TO BECOME A POLAR AMBASSADOR?

I was personally very interested because as a child my dad spent time in Greenland and Iceland and has many tales from his adventures there; a favourite being the time an Arctic fox stole his chocolate!

## DESCRIBE THE POLAR AMBASSADOR TRAINING DAY

The training day gave me a really good understanding of the project and confidence to lead a school on their polar journey. It opened up the various options we can offer schools and it was great to get hands on and exchange ideas with my fellow Ambassadors.

## WHAT HAVE THE SCHOOLS YOU'RE WORKING WITH DONE SO FAR?

All the schools I work with have approached the project slightly differently. One school ran a day where five classes rotated around five different

polar activities, meaning they covered an awful lot in just one day.

Another of my schools has approached the project as a way of involving the wider community – inviting everyone to a special assembly where they shared their learning in a big show and tell.

Activities that have gone down particularly well are blubber gloves, where we compare a hand in ice water versus a blubber coated hand in the same water. Pupils also like the salty seas activity where they learn about the effect that adding salt to water has on floating and sinking eggs.

## WHAT DO YOU HOPE THE PROGRAMME WILL GIVE THESE YOUNG PEOPLE IN THE FUTURE?

The earlier we get children excited about science and show them how it is relevant to their lives now and in the future, the better. Teaching STEM subjects through the context of building the RRS Sir David Attenborough has opened up new possibilities. By involving climate change, wildlife, geology, even welding and fabrication, means that all children can take something they're interested in from the project. In the future, we'll hopefully see enthused, skilled and able people entering STEM professions!

## WHAT ARE YOUR TOP TIPS ON HOW TO GET THE MOST OUT OF THE POLAR EXPLORER PROGRAMME?

- join the online community group – talk to other schools and exchange ideas
- dig deeper than the handbook – the book is a great place to start but the website has even more resources
- engage with a STEM Ambassador – they can help you identify your needs and feed into your action plan
- invest in plastic boats – the Polar Explorer resource box provides one as an example but get more so all children have one

## ALL ABOARD >

Use the Polar Explorer resources  
[www.stem.org.uk/mp/polar-explorer-resources](http://www.stem.org.uk/mp/polar-explorer-resources)

Engage with a STEM Ambassador  
[www.stem.org.uk/mp/stem-ambassadors](http://www.stem.org.uk/mp/stem-ambassadors)

Join the Polar community  
[www.stem.org.uk/community/groups/227280/polar-explorer-programme](http://www.stem.org.uk/community/groups/227280/polar-explorer-programme)

# Beyond the Partnership

by **STEVE THURGUR** Assistant Head Teacher, Mary Elton Primary School

Land yachts, catapults and shelters are an important part of science teaching in North Somerset. My school has a long history of working with five other local primary schools and annual projects are an essential part of that collaboration.

Our successful application for an ENTHUSE Partnership in 2014 has formalised our network and is enabling us to have a wider impact across the region. We wanted to run STEM projects and professional development on a larger scale, involving more schools and pupils, and the funded support we've accessed has provided this opportunity.

Adventures with practical STEM projects through our annual competition has been a key vehicle for collaborative learning across the region. In 2016, this competition followed a product design project, making wheelchairs in Tanzania. Children made wheelchairs using different materials and designs and they were tested using criteria such as speed and performance on different surfaces.

This project, and others like it, mean the children are a lot clearer about the many aspects of STEM, from product design, beginning to end, especially in terms of practicalities, finance and logistics. It's an integrated approach.

Last year's competition saw a satellite 'crash landing' in the school grounds: pupils arrived to find space debris being guarded by police and the fire service. This project was more teacher-led, with a competition to make Stomp Rockets being shared with a larger cluster of regional

schools. The sharing of resources for this project, which included teacher CPD, travel and materials, became excellent value for money with 4,000 pupils benefiting from a spend of only £1,000.

These types of project have helped to make science relevant to the children and allowed them to see it from a holistic point of view. The children can see that they can make an impact in their own world, that STEM has a solution to world issues. I believe we're empowering children and creating that interest in STEM from an early age. Not only that, but we've seen an impact on science achievement levels across the Partnership: 26.5% of pupils were above national expectations after one year.

Our next competition starts in March. It focuses on a child-led idea based around the sustainability of the environment, specifically helping the British hedgehog. Hedgehogs are in decline and suffer from the continued development of the urban sprawl. Generally described as a gardener's best friend, hedgehogs thrive in the habitats our back gardens provide. Hedgehogs need to walk a considerable distance each night to forage for food, but unfortunately our desire for privacy in our gardens, namely the impassable garden fence, hinders our hedgehog friends to a serious degree. A simple solution is to put a 12.5cm hole in the bottom of garden fences (or ramps over stone walls), creating valuable 'hedgehog corridors' across multiple gardens.

The plight of the hedgehog is a great illustration of how wildlife corridors can link together the islands created by human habitation. I think that teaching simple concepts like this can give children an excellent way of effecting change in a world-wide problem.

To reinforce this simple idea, the competition will involve the children making carts out of shoeboxes, dowel and MDF wheels to carry and launch toy hedgehogs through holes in 'cardboard fences'. The elastic-powered hedgehog carts will be judged on accuracy as they race through the holes in the fences. Simple games such as this not only go a long way in reinforcing the important concepts behind the fun, they build upon the enjoyment children feel when they pursue STEM related activities. We're trying to change the image of what STEM is about. It's everything around us, for everybody, not just men in white coats with crazy hair.

Links we've made through our ENTHUSE Partnership have meant we've found funding to buy some cameras to support the project and spread its impact. We'll give the cameras to other schools in the region to help them spread the idea of creating hedgehog corridors amongst their children. Placing the cameras over the hedgehog fence holes will capture footage of their importance as travel routes for our prickly friends. The footage can then be uploaded to a website

run by the North Somerset Partnership. If the children can see the hedgehogs using the holes, then that is a positive impact.

Our Partnership has gone from strength to strength and has grown from the initial six schools to now involve around 20, making it a more regional initiative. The sustained success provided by a combination of the ENTHUSE Partnership funding and the amazing ingenuity in the North Somerset Partnership is opening doors for thousands of children, letting them follow their hedgehog friends down the corridors to a lifelong interest in, and enjoyment of, STEM.



## Steve's recommendations when applying for an ENTHUSE Partnership

- commit to a timescale of three to six years
- split your money into chunks with a budget to give yourself some sustainability
- have many people in the school as stakeholders in the money, so it's not just one person controlling it. That allows teachers to see the broader value
- develop links with the community to provide stability and gain new contacts. For example, the parents who work in STEM industries – you will be amazed how many of them want to help
- simple things like getting teachers who have their own kids doing A levels or at university to come in and talk about themselves. Children love listening to people and finding out what they do

## CHANGING PERCEPTIONS >

- Apply for an ENTHUSE Partnership  
[www.stem.org.uk/mp/enthuse-partnerships](http://www.stem.org.uk/mp/enthuse-partnerships)
- Bring an expert into your classroom  
[www.stem.org.uk/mp/stem-ambassadors](http://www.stem.org.uk/mp/stem-ambassadors)
- Bring hedgehog corridors to your STEM Club  
[www.stem.org.uk/mp/stem-clubs](http://www.stem.org.uk/mp/stem-clubs)

# Outdoor learning with astronomy and space

by TOM LYONS > ESERO Teacher Fellow, STEM Learning

Seasonal changes make the spring term the ideal time to get outside and bring space education to life for your pupils.

## LOOK UP

The first half of January 2018, the phase of the moon coincides with the beginning of the school day, so the different phases of the Moon can be observed by the whole class. During the second half of February, children will be able to see the Moon around sunset.

Back inside you can model the phases of the Moon in the classroom, where children should be able to see why you cannot see a full moon during the day (unless you live close to one of the poles). We have a free, simple resource on our website from the Royal Observatory Greenwich to help you with this.

## RESOURCES TO INSPIRE >

- Daytime moon viewing  
■ [www.stem.org.uk/rxywz](http://www.stem.org.uk/rxywz)
- Find out when you can see the ISS  
■ [www.heavens-above.com](http://www.heavens-above.com)

## CPD BRIGHT SPARKS >

- Teaching primary science: exploring space  
■ [www.stem.org.uk/ne003](http://www.stem.org.uk/ne003)
- Taking science outside  
■ [www.stem.org.uk/rp111](http://www.stem.org.uk/rp111)
- Space Education Quality Mark  
■ [www.stem.org.uk/recognition](http://www.stem.org.uk/recognition)

## INTERNATIONAL SPACE STATION

After the Moon, the brightest object in the night sky is actually the International Space Station (ISS). There are many websites and apps that will tell you when you can next see the ISS passing overhead. Like the Moon, the light from the ISS comes from reflected light from the Sun. It takes only 92 minutes to travel around the Earth, at a speed of 7.66km/s. You could set a challenge for your class to time how long they can see it in the sky and work out how far it has travelled in this time.

## PLANETARY

Children can also view many planets with the naked eye. The word planet means wandering star. Viewing over a number of days, you can see the planets change position in the night sky. My top tip for the best display is to look to the south, at 7am on 11 January 2018, where you will be able to see the Moon, with both Mars and Jupiter just below.

Here's hoping for clear skies!

## SCALE MODELLING

Scale models are a great activity for the outdoor classroom. There are many ways of modelling the solar system, but one of my favourites is the toilet roll model. With each sheet representing the distance of around 30 million km, you get the following scale that can be completed using one big toilet roll.

A common misconception is that the Moon only "comes out at night". One way to dispel this myth is to do some daytime Moon observation. Normally, you don't see the Moon during the day because the scattered light from the Sun is too bright. However, at sunrise and sunset, the Moon is bright enough to be seen.

PLANET	#SHEETS FROM THE SUN
Mercury	2 sheets
Venus	4 sheets
Earth	5 sheets
Mars	8 sheets
Jupiter	26 sheets
Saturn	48 sheets
Uranus	97 sheets
Neptune	153 sheets

# How to support SEND learners in computing

by CATHERINE ELLIOT > eLearning Consultant, Sheffield City Council eLearning Service

Technology can provide great learning opportunities for children with special educational needs and disabilities, but aspects of the computing curriculum can remain challenging to these learners. The good news is that approaches for SEND children will be beneficial to all pupils.

Make sure that your resources are accessible by using a range of media: audio, text, images and video; symbol support for weaker learners (using specific software to add symbols to text); high contrast colours; coloured overlays for dyslexic children if required. Here are some more specific ways to support your children with the computer science elements of the curriculum:

## SUPPORTING COMPUTATIONAL THINKING

Use unplugged activities to introduce key concepts using multisensory inputs to help children make concrete connections with the learning. For example:

- MOVEMENT** – complete a bubble sort to arrange children in order of height on a bench; sequence a set of dance moves to choreograph a class dance.
- SOUND** – record story parts on recordable buttons for children to sequence, add image support if required; create an algorithm to play music by sequencing images of different instruments for children to play.
- PHYSICAL OBJECTS** – sort toy animals into categories according to key features (practising pattern recognition); listen to a story and pick out the objects mentioned and put in the correct order (sequencing and abstraction).

## SUPPORTING PROGRAMMING

Encourage children to plan programs away from the computer using command cards (for Bee-Bots/Scratch). This helps children to build up the program in smaller steps and ensure they understand the problem they are solving. Add symbols or images on the reverse of Scratch commands to help with understanding. Ensure that children understand key commands by walking through a program, with one or more person acting as the sprite. Provide sample code that can be adapted by children to create their own activity, or a partially completed program for them to add to. Focus on a limited set of commands to use in a program.

## MAKE USE OF OUR SCRATCH SUPPORT >

- SEND Scratch activities  
■ <http://sheffieldclc.net>
- Barefoot SEN resource  
■ <https://barefootcas.org.uk>

## GLOSSARY

- Computational thinking:** allows us to take a complex problem and break it down into an easy way for a machine - or human - to solve.
- Bubble sort:** is a simple sorting algorithm that compares two values - swapping them until the pairs are correct.
- Sprite:** a two dimensional computer graphic.

## CPD TO SUPPORT YOU AND YOUR SEND PUPILS >

- Teaching computing to pupils with special educational needs and disabilities  
■ [www.stem.org.uk/cy700](http://www.stem.org.uk/cy700)
- SEND computing conference  
■ [www.stem.org.uk/cy701](http://www.stem.org.uk/cy701)

# Teaching at greater depth

## COMPUTING

by **DAVE GIBBS** Computing CPD Lead, STEM Learning  
@adgibbs

Some children grasp concepts rapidly and are ready for more of a challenge. The key to achieving mastery is to go deeper, not faster; there's no need to sprint into text-based programming, for instance.

### CHALLENGE ONE

Let's start with algorithms. Classroom activities, such as 'sequencing my day' or programming a Bee-Bot, often emphasise the importance of clear instructions. Less explored is the 'flow of control'; the aspects of an algorithm that make decisions based on conditions. For instance, deciding whether it's a school day upon waking will result in following different sequences of instructions – "roll over and go back to sleep" being an ideal outcome!

### CHALLENGE TWO

Algorithms that do similar tasks aren't all equally efficient, which can affect the performance of computers stepping through one instruction at a time. A search engine may sort lists millions of times each second, and children can explore the best ways to do so using weighing scales or even folk dances.

Going beyond unplugged algorithms to executing them in programs is a challenging step, as debugging can be difficult for younger learners. Creating algorithms based in physical computing, using Crumble controllers, Makey Makey devices or micro:bits results in program outputs that can be seen and debugged, instead of on-screen errors that can be hard to trace.




### CHALLENGE THREE

An understanding of data is important in both computing and maths, and will serve children well in later years. Is a telephone number really



a number? Do we ever add them up? Can we record yes or no answers from a survey using Boolean true or false, saving storage space and speeding up algorithms? These small differences soon add up with millions of records or more. Try exploring the advanced search pages of a huge online retailer and consider the different types of data they need to handle. Even better, take children through the whole process of designing a data-capture form linked to your current teaching topic. Test it out with real people, then improve it and retest – there is a skill in getting people to answer the questions that provide usable data that can be processed and presented.

Whatever the level of your children, the **Computing at School (CAS) progression pathways document can help you plot out next steps. Take your children deeper into computing, they're sure to enjoy the ride.**

#### DIVE INTO OUR RESOURCES >

-  Simple sequences for KS1  
■ [www.stem.org.uk/rxcwye](http://www.stem.org.uk/rxcwye)
-  Sorting algorithms  
■ [www.stem.org.uk/rxznu](http://www.stem.org.uk/rxznu)
-  CAS progression pathways  
■ [www.stem.org.uk/rx34b2](http://www.stem.org.uk/rx34b2)

#### COMPUTING CPD >

-  Data handling with ICT  
■ [www.stem.org.uk/cy013](http://www.stem.org.uk/cy013)
-  Computing conference with CAS Regional Centre for Yorkshire and Humber  
■ [www.stem.org.uk/cy007](http://www.stem.org.uk/cy007)

## MATHEMATICS

by **HELEN JONES** Maths Specialist, Ebor Academy  
@Missdks2

The term greater depth alone advocates that all our children are entitled, as a minimum, to a deep understanding of mathematics. And whilst children are expected to "move through the curriculum at broadly the same pace", how can we ensure our lessons give all children ample opportunities to think in greater depth?

2015, Year 6. It soon became apparent that my new class of 'level 5' children had been fed a rich diet of superficial knowledge. When asked  $5/7 + 1/7$ , they immediately chirped  $6/7$ . But when asked to show  $5/7$ , to explain five sevenths, they were shocked and stumped. For these children knew not of explaining their reasoning, nor of showing their understanding, for these children only knew the answer.

Below, I will outline some strategies I implemented to provide opportunities for depth. Throughout all, creating an atmosphere where language, discussion and 'what ifs' were key.

**Concrete and pictorial experiences** are crucial to underpinning a firm understanding of the abstract. Whilst introducing children to new concepts, I ensured that we used suitable equipment or used familiar real-life experiences – this helped children to build new knowledge and move quickly into the abstract. Activities of this type also lend themselves to mathematical discussions and with effective prompting, high-quality reasoning and generalisations became the norm in class, both teacher to child, and more importantly, child to child.

**Low threshold, high ceiling tasks**, as coined by NRich, provide many opportunities for children to use a greater depth of thought. These activities can span a whole lesson or be a smaller element. I found using the question stems stated, it became much easier to create rich tasks tailored to the objective. Tasks were more successful when




children had 90% of the knowledge needed for the task – then could apply their learning in a logical way whilst discovering new things.

Some of my favourite tasks are a mix of high-quality questioning within a low threshold task. For example, "Using 36 cubes, make a cube or cuboid, and another, and another..." This task provided rich discussion between children, an opportunity for assessment for learning around shape and, more importantly, allowed the children to link their understanding of area to volume.

#### Question stems which can promote reasoning and a greater depth of thought:

- always, sometimes, never
- prove it
- true or false
- odd one out
- do, then explain
- spot the mistake
- and another, and another, and another
- the answer is, what's the question?
- what comes next? Continue the pattern
- what's the same? What's different?
- change one thing
- one hard, one easy

#### RESOURCES AND CPD FOR GREATER DEPTH >

-  Mathematics in the early years  
■ [www.stem.org.uk/my008](http://www.stem.org.uk/my008)
-  Developing excellence in upper KS2 science and mathematics  
■ [www.stem.org.uk/ny057](http://www.stem.org.uk/ny057)
-  NRich resources lists  
■ [www.stem.org.uk/lxerwm](http://www.stem.org.uk/lxerwm)

# In the spotlight...

with **VICTORIA GREGORY** Science Coordinator, Sonning Common Primary School

## Where did you hear about STEM Insight?

I was Googling for information in relation to my science role and came across BAM Construction. I contacted them to see if they could come into school do some workshops. After speaking to my contact there about work experience, I learned about the STEM Insight placement programme. I browsed the website and filled out the application form and to my surprise, I was contacted and offered a place!

## What motivated you to apply for and participate on the placement?

I love finding out about industry and how we can relate the real world in education and work together.

## What did you want to achieve for yourself, your pupils and your school?

A better understanding of other work places, career routes in and what academic and social qualities companies are looking for.

## What were the most valuable moments of the placement and why?

Speaking to a number of different professionals in different roles. This gave me a wider understanding of what is out there and what is available to young people.

## What did you take away from the STEM Insight placement, in terms of new strategies, ideas – or even just more confidence?

It was an invaluable experience in building links, being able to relate real life to the classroom, informing the children about other workplaces. I would happily do it all again.

## What were the key things you learnt about STEM careers that you weren't already aware of?

I didn't realise the variety available and the different routes in. I became more familiar with the apprenticeships.

## What positive impacts have you achieved so far for yourself, your pupils and colleagues in your school?

I feel more able to inform children about possible career fields and jobs. I can bring what I learned into my teaching, making it relevant and current.

## How will you use your new knowledge in the future?

To help plan lessons that include BAM Construction and other businesses to arm children with information about what they're doing in lessons and why.

## What are your top tips for getting the most from a STEM Insight placement?

Be up for it! Don't be afraid to ask people about their experiences, make connections, invite them into school – many of the people I met stated that they'd love to come into schools and teach. For example, the IT consultant would love to have come in to show the children some fun programming.

## What would you say to someone considering applying for a placement?

Go for it!

[www.stem.org.uk/mp/stem-insight](http://www.stem.org.uk/mp/stem-insight)



# Increasing science engagement through STEM

by **LIZ LISTER** Senior STEM Manager, Graphic Science (STEM Ambassador Hub West England)

Of the many publications produced by Ofsted over the years, the one I reach for most is *Maintaining Curiosity*. Published in 2013, it still provides a neat summary of how good teachers keep their pupils hooked on science throughout their schooling.



When getting bogged down by the curriculum it is easy to lose sight of why we do science in the first place. By being super curriculum-focused, science might seem like something which is just a body of facts to be learned and procedures to be followed. However, if that were the case, why are we so bothered about engagement in science? Why bother maintaining curiosity at all?

Placing science as part of STEM – adding engineering, technology and mathematics to the mix – we can pull ourselves out of the curriculum bog and into the open. The curriculum is still there to be taught, but we can now see much further. By placing science in a relevant context, we can help our children see further too. Science isn't just interesting (sometimes it might not even be that), but it can take you places.

What's great about the idea of maintaining curiosity through STEM is that it doesn't rely on being an all-knowing science guru in order to keep children interested in science. What it requires is connections: connections between subjects, connections between ideas and connections between people – teachers, scientists and engineers.

STEM is big business across the UK, and there's no way any one teacher can know everything


there is to know about the STEM industry in any one locality. STEM Ambassadors – scientists and engineers from local STEM businesses and organisations – have insight into this which is hard to uncover from the outside.

So what happens when you put on an activity that connects primary school children with real-life scientists and engineers from their local area?

St Paul's Catholic Primary School in Yate, South Gloucestershire held a Super Science Saturday event with the aim of raising the level of engagement with science learning in children and their parents. With help from STEM Ambassadors and other local volunteers, teachers were able to put on a free event for families, which included workshops and competitions, all showcasing a different aspect of STEM in a fun, engaging and accessible way. STEM Ambassadors highlighted how the activities related to their STEM job and the event generated a real science buzz around the school which then followed through with the parents to home.

Have you done anything similar in your community? Share your story with us on Twitter @STEMLearningUK

## STAY CURIOUS WITH OUR RESOURCES

 Ofsted's Maintaining Curiosity report  
[www.stem.org.uk/rx33n9](http://www.stem.org.uk/rx33n9)

 Curiosity Connections  
[curiositybristol.net](http://curiositybristol.net)

## CPD FOR THE CURIOUS

 Primary STEM conference  
[www.stem.org.uk/primary-conference](http://www.stem.org.uk/primary-conference)

 Local primary science conference  
[www.stem.org.uk/rp124](http://www.stem.org.uk/rp124)

# The value of tinkering:

by GEMMA TAYLOR Technology CPD Lead, STEM Learning

Making is a great way for children to explore new ideas and take their first steps into engineering. We've all met those children that just seem to have the knack of building things or putting things together – maybe you were that child? What if there was a way of encouraging all children to learn this way? What would be the benefits? We talked to two leading experts about their approach to hands-on learning.

**Dr Jon Chippindall, Science and Engineering Education Research and Innovation Hub, (SEERIH) Engineering Champion:**

"To me, tinkering is about enhancing creativity by 'flipping the funnel'; let me explain what I mean..."

In more traditional approaches to 'creating', it is tempting to start out with an end in mind, and we might find the create process simply funnels children to a predefined outcome. Tinkering 'flips the funnel', with children starting from the same point (the challenge and/or the resources) but with genuine room to exercise their creativity and curiosity in problem solving. The path children take in reaching their solution might be a meandering one, and this is fine. Rather than strictly constraining them to a linear process of plan, make and evaluate, tinkering embraces such meandering and reflection. For example, we might make a few notes as a plan before starting to create, and then adjust these in light of successes and failures in our project – flipping from hands-on to minds-on. It is this 'room' in the tinkering approach, which allows creativity to flourish and children's curious minds to lead their learning experiences."

**How to set up tinkering in the classroom: Julie Wiskow @wiskow\_julie**

"Before you and your children start tinkering, it is important to consider the engineering materials that you want the children to work with. We set up a tinkering box full of cheap or free materials like cardboard, paper, string, yoghurt pots, lollipop sticks, plastic bottles and elastic bands. We keep the box full by sending out a letter to parents at the beginning of each term asking them for donations!

Allowing children to explore and become familiar with a material gives them confidence when developing their own ideas. For example, you could give them some



card and ask them to create a structure between two books that can support a certain weight. By trial and error, and using the skills they have learned, the children soon realise that folding the paper and positioning it in a particular way creates a much more solid and effective structure. Time for testing and adapting their designs is key: the message is always that failure is part of the learning process and just leads to a better outcome.

Once basic skills are learned then you can set up regular 'tinkering sessions'. These can be anything from making a marble run to designing catapults or balloon-powered vehicles. There is

# teaching children to engineer through making



"Make a few notes as a plan before starting to create, and then adjust these in light of successes and failures..."

a wealth of ideas on Pinterest, which you can easily access. All the activities we set have a defined outcome that can be measured. This makes the tinkering purposeful and helps the children to remain on task. Once they have been set the task, we step away and the children work out the best ways of achieving their goal.

Stepping away from your class to let them work without instructions can be challenging, but not without its benefits. By using this time to observe how children respond to the environment, we have been able to target future skill development.






Perhaps one of the most significant benefits from tinkering is that the resilience of our children has increased, often spilling out into other areas of their learning. They have become so used to the approach of plan, try, evaluate and improve through tinkering, that they are naturally unpicking their ideas and starting again in other lessons, such as maths and English. This goes back to the understanding that when they are tinkering, there is no such thing as failure and every session is an opportunity to try a new idea. They have become more willing to share their thoughts with others and collaborate in groups – articulating their ideas with eloquence and clarity. We have found that all children have been able to access our tinkering projects in some way and many children who struggle in other areas of the curriculum have shone whilst tinkering.

Once a term we run a workshop that runs for a whole day. Children are given the materials, placed into groups and have to independently solve a challenge that we set for them. Last term we had a cardboard tinkering day which involved children, teachers and parents. The day began with an excellent presentation by Pete Lomas, who talked about how he had progressed from messing about with cardboard boxes and train sets as a boy, to developing the third most successful computer in the world – the Raspberry Pi. There were pirate ships being built in Year 1, castles and buildings from the recent trip to Llandudno in Year 2 and cardboard cranes in Year 3, which were powered by syringes – very inventive.

Year 4 focused on furniture and large-scale cardboard animals, including a spectacular giraffe and Years 5 and 6 worked collaboratively to produce funfair elements. It was a fantastic day, particularly seeing the parents working so enthusiastically alongside their children.

This term I think the day's focus is going to be on kites – I can't wait!"

## ENGINEER SOME SUPPORT

-  Teaching engineering in the primary classroom  
■ [www.stem.org.uk/ty005](http://www.stem.org.uk/ty005)
-  Scratch tinkering  
■ [www.stem.org.uk/rx34sp](http://www.stem.org.uk/rx34sp)
-  Barefoot computing  
■ [www.stem.org.uk/cx665](http://www.stem.org.uk/cx665)
-  STEM Ambassadors  
■ [www.stem.org.uk/mp/stem-ambassadors](http://www.stem.org.uk/mp/stem-ambassadors)
-  STEM Clubs  
■ [www.stem.org.uk/mp/stem-clubs](http://www.stem.org.uk/mp/stem-clubs)



# STEM Clubs Week 5 to 10 February

Celebrate your  
STEM Club and  
get inspired

## A week of inspiration:

- looking to the future with careers
- free support packages
- resource your Club
- using STEM Ambassadors

#STEMclubswk2018

[www.stem.org.uk/mp/stem-clubs](http://www.stem.org.uk/mp/stem-clubs)

## CALENDAR

# Our top picks for your calendar...



EDITOR'S  
TOP  
PICK

### STEM CLUBS WEEK 5-10 FEBRUARY

STEM Clubs are a highly enjoyable way to engage pupils with STEM subjects. Whether you're looking to set up a STEM Club or build up an existing one, there are plenty of ways you can get involved with STEM Clubs Week.

■ [www.stem.org.uk/mp/stem-clubs](http://www.stem.org.uk/mp/stem-clubs)

### NATIONAL STORYTELLING WEEK 3-10 FEBRUARY

Children's stories provide a great context for learning science. Explore our resource packages based around popular children's books and discover the science hidden in a book.

■ [www.stem.org.uk/mp/stories](http://www.stem.org.uk/mp/stories)



### BRITISH SCIENCE WEEK 9-18 MARCH

Featuring fascinating and engaging activities, British Science Week is a celebration of all things science, technology, engineering and mathematics. Look out for the resources linked to our Polar Explorer programme in this year's activity pack.

■ [www.stem.org.uk/cx5j7](http://www.stem.org.uk/cx5j7)

### ENTHUSE CELEBRATION AWARDS

Our ENTHUSE Celebration Awards have been designed to celebrate you and your commitment to CPD. Free to enter, regional events will take place around the UK and the finalists will be invited to a prestigious awards event at the Houses of Parliament in July.

Could you be one of our winners?

■ [www.stem.org.uk/ms/awards-and-recognition](http://www.stem.org.uk/ms/awards-and-recognition)



Let's take a peek at what people have been tweeting:



I had an amazing 2 days CPD at @STEMLearningUK. Great speakers, workshops, food & colleagues to network with. Check out their other courses



Excited to be part of the polar explore programme with @STEMLearningUK and @Technquest @pontlottyn



So proud to have received an @STEMAmbassadors award recognising our @SparkLab\_HJS and our Norfolk leading #STEM innovation. @laurencope



Such an honour to have been named the 2nd honorary #STEM ambassador today alongside Tim Peake. Thank you @STEMLearningUK! #HouseofLords



Follow us @STEMLearningUK and let us know what STEM related things you're up to!

# Spring into our CPD

This spring let us help you discover the perfect CPD to help you develop in your role and support your pupils more effectively.

We are the UK's largest provider of subject-specific CPD for teachers, technicians and support staff. Coming on our CPD will have an impact on you and your pupils:

- 75% of teachers see improvements in pupil engagement in STEM subjects
- 45% see pupils achieving better marks

You can access our CPD nationally, locally and online. See what the year could hold for you [www.stem.org.uk/cpd](http://www.stem.org.uk/cpd)



We are offering a 100% discount on the activity fee for a range of our spring term National STEM Learning Centre CPD, to help more state-funded schools and colleges benefit:

- find the CPD with a yellow circle in the listing
- when booking online use the code PRISUMMER18
- pay the VAT (which as a state-funded school or college you may be able to claim back)

Some courses also still offer an ENTHUSE bursary. This offer is only available for state-funded schools and only for the courses marked in the CPD listing. For more details please see the website.

All fees and bursary values are valid for state-funded schools and are correct at the time of print (November 2017). See [www.stem.org.uk](http://www.stem.org.uk) for fee-paying schools and the latest information.

## Our ENTHUSE bursary-funded residential courses are run at the National STEM Learning Centre in York.

Teachers and others working in state-funded schools in the UK are eligible for these bursaries which can be used to contribute to covering the cost of course fees, supply cover, travel, accommodation, or equipment for your school.



### COMPUTING

**INTENSIVE SUBJECT-SPECIFIC CPD**  
Accommodation and meals included



#### TEACHING COMPUTING TO PUPILS WITH SPECIAL EDUCATIONAL NEEDS AND DISABILITIES

The computing curriculum provides the opportunity to teach pupils key problem-solving, literacy, numeracy and life skills. Develop the confidence and practical ideas to adapt the curriculum for the specific needs of your learners.

- Your school receives: £250 ENTHUSE bursary
- Activity fee: £300 (excl VAT)
- 17 May 2018 (1 day)
- [www.stem.org.uk/cy700](http://www.stem.org.uk/cy700)

### DESIGN & TECHNOLOGY

**INTENSIVE SUBJECT-SPECIFIC CPD**  
Accommodation and meals included



#### HANDS-ON ROBOTICS FOR KEY STAGE 2 WITH THE CRUMBLE CONTROLLER

Find out how the Crumble Controller can bring hands-on robotics into your classroom

- Your school receives: £700 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 19 June 2018 (2 days)
- [www.stem.org.uk/ty029](http://www.stem.org.uk/ty029)



#### TEACHING ENGINEERING IN THE PRIMARY CLASSROOM

Find out how engineering can be used as an exciting context for primary lessons and help inspire the young engineers of the future.

- Your school receives: £700 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 7 June 2018 (2 days)
- [www.stem.org.uk/ty005](http://www.stem.org.uk/ty005)

"I found the full training very useful. I had no prior learning on Crumble. This course allowed me to start simple. I learnt how to set up the kit, send simple algorithms and then build on my learning. The following day we progressed onto Crumble playgrounds. Having this time, allowed my understanding to become secure and confidence of the subject and use of equipment to grow."

- Jenny Hindson  
Eastfield Primary School

### MATHEMATICS

**INTENSIVE SUBJECT-SPECIFIC CPD**  
Accommodation and meals included

#### MATHEMATICS IN THE EARLY YEARS

Explore how children learn within mathematics and develop mastery in number.

- Your school receives: £600 ENTHUSE bursary
- Activity fee: £500 (excl VAT)
- 8 May 2018 (2 days)
- [www.stem.org.uk/my008](http://www.stem.org.uk/my008)

#### TEACHING PRIMARY MATHEMATICS FOR NEW AND RECENTLY QUALIFIED TEACHERS

Explore current good practice in mathematics, engage with practical resources to support learning in mathematics and develop your assessment for learning skills.

- Your school receives: £900 ENTHUSE bursary
- Activity fee: £750 (excl VAT)
- 19 April 2018 (3 days)
- [www.stem.org.uk/my006](http://www.stem.org.uk/my006)

#### USING MANIPULATIVES TO ENHANCE UNDERSTANDING AND PROBLEM SOLVING IN PRIMARY MATHEMATICS

Encourage active learning in primary mathematics lessons with the use of different manipulatives. Explore the use of manipulatives to consolidate understanding from year 1 to year 6.

- Your school receives: £600 ENTHUSE bursary
- Activity fee: £500 (excl VAT)
- 7 June 2018 (2 days)
- [www.stem.org.uk/my005](http://www.stem.org.uk/my005)

## SUMMER CONFERENCE

Inspire your pupils and develop your cross-curricular approach to teaching STEM subjects.

Come to one day or come to them all. Each day costs £80 and state-funded schools get a £100 ENTHUSE bursary.

Book today: [www.stem.org.uk/primary-conference](http://www.stem.org.uk/primary-conference)

## SCIENCE

### INTENSIVE SUBJECT-SPECIFIC CPD

Accommodation and meals included



#### DEVELOPING AN OUTSTANDING PRIMARY SCIENCE CURRICULUM

This CPD activity will give you either a starting point or springboard to practical advice and a range of approaches for developing a primary science curriculum.

- Your school receives: £1,200 ENTHUSE bursary
- Activity fee: £1,000 (excl VAT)
- 18 June 2018 (4 days)
- [www.stem.org.uk/ny044](http://www.stem.org.uk/ny044)

#### PLANTS: GROWING YOUR PRIMARY SCIENCE CURRICULUM YEAR 1 TO YEAR 6

With the support of STEM Learning and the RHS, develop the skills and knowledge to use plant science confidently throughout key stages 1 and 2. Be inspired with curriculum linked projects to share with all year group teachers and ensure plants feature in exciting lesson ideas.

- Your school receives: £700 ENTHUSE bursary
- Activity fee: £500 (excl VAT)
- 14 June 2018 (2 days)
- [www.stem.org.uk/ny019](http://www.stem.org.uk/ny019)

#### PRIMARY SCIENCE FOR NEW AND RECENTLY QUALIFIED TEACHERS

Learn how to plan appropriate and varied lessons in STEM subjects. This activity will help you answer difficult questions from children and increase your understanding of the primary curriculum.

- Your school receives: £900 ENTHUSE bursary
- Activity fee: £900 (excl VAT)
- 25 April 2018 (3 days)
- [www.stem.org.uk/ny015](http://www.stem.org.uk/ny015)

#### USING TECHNOLOGY TO CREATE AN ENGAGING AND PURPOSEFUL SCIENCE CURRICULUM

Explore how data loggers and other forms of digital technology can support learning in science.

- Your school receives: £700 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 21 June 2018 (2 days)
- [www.stem.org.uk/ny011](http://www.stem.org.uk/ny011)

### CPD NEAR YOU

Browse dates and venues online

#### ASSESSMENT AND PROGRESSION IN PRIMARY SCIENCE

Effective assessment for learning leads to raised attainment. Identify how you can integrate and embed assessment practices into your science teaching.

- browse dates and venues online
- [www.stem.org.uk/rp102](http://www.stem.org.uk/rp102)

**“The whole course was useful, particularly the conversation that was facilitated between colleagues from different schools and different levels of teaching experience.”**

- Fiona White  
Prospect Vale Primary School

#### CREATING A BUZZ AND RAISING THE PROFILE OF SCIENCE IN YOUR SCHOOL

You will leave full of practical ideas to enrich primary science in your school. You will be inspired to enthuse your pupils about the thrill of scientific ideas and science enquiry.

- browse dates and venues online
- [www.stem.org.uk/rp117](http://www.stem.org.uk/rp117)

#### DEVELOPING THE ROLE OF THE SCIENCE SUBJECT LEADER

Explore strategies to help you audit and lead science in your school, understand your role more fully and be able to identify and promote effective primary science.

- browse dates and venues online
- [www.stem.org.uk/rp101](http://www.stem.org.uk/rp101)

#### ENGAGING SCIENCE IN KEY STAGE 1

Try out ideas for practical science that can be used with young children to develop a range of scientific skills and explore opportunities to promote children's social skills.

- browse dates and venues online
- [www.stem.org.uk/rp109](http://www.stem.org.uk/rp109)

#### LINKING CORE SUBJECTS; SCIENCE AND MATHEMATICS

Maximise your pupils' opportunities to develop their numeracy skills and improve attainment in science by planning lessons in which children effectively handle data.

- browse dates and venues online
- [www.stem.org.uk/rp113](http://www.stem.org.uk/rp113)

#### MAKING POWERFUL CONNECTIONS BETWEEN LITERACY AND SCIENCE

Explore the curriculum links between science and literacy and how to develop literacy skills to improve the quality of children's written explanations in science.

- browse dates and venues online
- [www.stem.org.uk/rp114](http://www.stem.org.uk/rp114)

#### PRIMARY CONFERENCE

Our primary conferences always provide outstanding learning opportunities linked to topical developments in primary science teaching alongside time to talk and share ideas with other primary practitioners.

- browse dates and venues online
- [www.stem.org.uk/rp124](http://www.stem.org.uk/rp124)

#### PRIMARY SCIENCE SUBJECT LEADERS' NETWORK

Learn about the latest local and national initiatives in science and keep abreast of developments within the subject.

- browse dates and venues online
- [www.stem.org.uk/rp121](http://www.stem.org.uk/rp121)

#### PROMOTING THINKING AND TALKING IN PRIMARY SCIENCE

Consider the key elements of thinking, talking and communicating in science and develop these skills to create an effective learning environment in your classroom.

- browse dates and venues online
- [www.stem.org.uk/rp116](http://www.stem.org.uk/rp116)

#### RAISING ATTAINMENT IN PRIMARY SCIENCE

Move good lessons to outstanding by identifying and exploring issues relating to raising attainment in your school.

- browse dates and venues online
- [www.stem.org.uk/rp103](http://www.stem.org.uk/rp103)



#### STRENGTHENING SUBJECT UNDERSTANDING IN...

Focus on the big ideas in primary science, helping you make a difference to children's learning by identifying and challenging misconception.

- browse dates and venues online
- [www.stem.org.uk/rp112](http://www.stem.org.uk/rp112)

#### SUPERMARKET SCIENCE

Discover a bank of easy to use ideas that you can take away with you to enable your pupils to conduct experiments and have fun.

- browse dates and venues online
- [www.stem.org.uk/rp125](http://www.stem.org.uk/rp125)

#### TAKING SCIENCE OUTSIDE

Create exciting and inspiring investigations using your outdoor environment that will motivate and engage your pupils to learn.

- browse dates and venues online
- [www.stem.org.uk/rp111](http://www.stem.org.uk/rp111)

#### TEACHING SCIENCE IN EYFS

Increase your confidence in using a range of approaches and assessment strategies to meet children's needs in early years.

- browse dates and venues online
- [www.stem.org.uk/rp120](http://www.stem.org.uk/rp120)

#### USING APPS TO SUPPORT LEARNING IN THE PRIMARY CLASSROOM

Build your confidence in using apps and ICT to enhance pupils' engagement and achievement in science.

- browse dates and venues online
- [www.stem.org.uk/rp137](http://www.stem.org.uk/rp137)

#### USING COMPUTING AND DATA LOGGING TO SUPPORT SCIENCE

Gain hands-on practical experience using digital technologies in science and be able to decide on the best use of the technology and integrate them into your science lessons.

- browse dates and venues online
- [www.stem.org.uk/rp115](http://www.stem.org.uk/rp115)

#### WHY CHILDREN NEED TO WORK SCIENTIFICALLY AND HOW THEY CAN

Improve children's outcomes through effective teaching of scientific enquiry.

- browse dates and venues online
- [www.stem.org.uk/rp107](http://www.stem.org.uk/rp107)

#### WORKING SCIENTIFICALLY IN THE PRIMARY CURRICULUM - PUPIL LED INVESTIGATIONS

Explore a range of techniques to draw out pupil ideas and develop strategies to inspire and incorporate these ideas into your science lessons.

- browse dates and venues online
- [www.stem.org.uk/rp108](http://www.stem.org.uk/rp108)

**“The presenters were very knowledgeable and shared a wealth of theory and ideas that I will be able to use to impact the teaching in my own school.”**

- Louise Parks  
Bournmoor Primary School

## CROSS-CURRICULAR

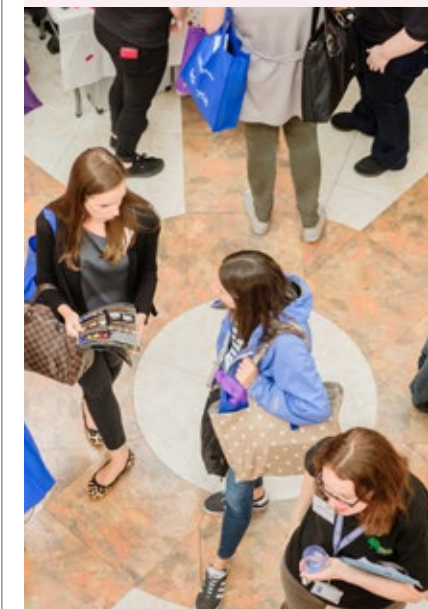
### INTENSIVE SUBJECT-SPECIFIC CPD

Accommodation and meals included

#### DEVELOPING EXCELLENCE IN UPPER KS2 SCIENCE AND MATHEMATICS

Develop confidence in your subject knowledge and understanding of mathematics and science at upper KS2.

- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 2 July 2018 (2 days)
- [www.stem.org.uk/ny057](http://www.stem.org.uk/ny057)



#### PRIMARY CONFERENCES

For primary teachers who want to inspire their pupils and develop their crosscurricular approach to teaching STEM.

Come to one day, or come to them all:

Day 1 - science

Day 2 - mathematics

Day 3 - computing

- Your school receives: £100 ENTHUSE bursary
- Activity fee: £80 (excl VAT) per day
- [www.stem.org.uk/primary-conference](http://www.stem.org.uk/primary-conference)

#### USING IPADS, CHROMEBOOKS AND OTHER TABLET DEVICES IN THE PRIMARY CLASSROOM

Explore how mobile technology is used inside and outside of the classroom, providing time for you to familiarise yourself with the device, its potential applications and its teaching capabilities.

- Your school receives: £700 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 7 June 2018 (2 days)
- [www.stem.org.uk/ty015](http://www.stem.org.uk/ty015)

**ONLINE**

**DIFFERENTIATING FOR LEARNING IN STEM TEACHING**

Explore the key principles of effective differentiated learning and how to differentiate by task. Take away practical ideas of how you can best respond to the assessment evidence you get from your pupils.

- Activity fee: Free
- 16 April 2018 5 weeks
- [www.stem.org.uk/ne702](http://www.stem.org.uk/ne702)



**SCIENCE OF LEARNING**

How can you use the science of learning to improve pupils' academic outcomes in STEM subjects? Learn from experts including Professor Paul Howard-Jones, Professor of Neuroscience and Education.

- Activity fee: Free
- 16 April 2018 5 weeks
- [www.stem.org.uk/ne709](http://www.stem.org.uk/ne709)

**TEACHING PRIMARY SCIENCE: EXPLORING SPACE**

Learn about current and future missions to explore our solar system and beyond. Discover effective ways to engage children in science and wider STEM activities using the context of space exploration.

- Activity fee: £27 (excl VAT)
- 30 April 3 weeks
- [www.stem.org.uk/ne003](http://www.stem.org.uk/ne003)



**FREE**  
cross-curricular online  
CPD to help you:

- understand how your pupils learn
- unlock your pupils' learning potential
- take part in action research with leading neuroscience academics and other teachers

**The science of learning**

[www.stem.org.uk/ne709](http://www.stem.org.uk/ne709)

**POLAR EXPLORER PROGRAMME**

Free online resources to help bring out the inner explorer in your pupils



Our latest free programme is linked to the UK's new polar research ship, the RRS Sir David Attenborough. We have resources, activities and guidance to help you bring STEM subjects to life in the classroom:

- engineering
- climate change
- animals, food chain and adaptation
- exploration
- oceans



Visit our website to inspire the next generation of scientists, engineers and adventurers [www.stem.org.uk/mp/polar-explorer](http://www.stem.org.uk/mp/polar-explorer)

# Free online CPD to develop your career



Access STEM-specific  
free online CPD and  
learn whenever and  
wherever suits you

- mentoring from educational experts
- peer-to-peer support from a network of teachers
- reflect on and develop your practice each week

[www.stem.org.uk/mp/online-cpd](http://www.stem.org.uk/mp/online-cpd)