

# primary (stem) LEARNING

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## Talking careers in primary school

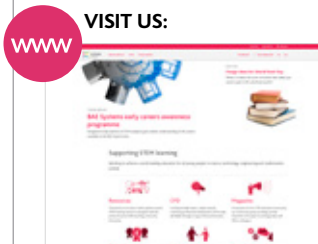
Igniting interest at an early age



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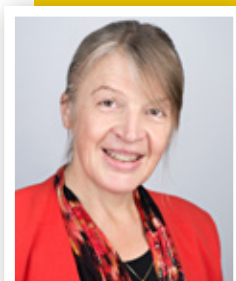


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# Welcome



## Welcome to the summer 2017 STEM Learning magazine.

This edition we've got some excellent articles to help you plan for the next academic year, and build strategies to support every member of your teaching community. Head to page five if you are looking to better support newly qualified teachers; a guide to successfully managing the transition from primary to secondary is on page seven; and on page 14 we've created a pathway to help you produce a strategy for using CPD at every stage of a teacher's career.

The best part of my role is meeting and working with such a huge variety of individuals and organisations, all united in wanting to give young people the best possible start in life through STEM. Teachers, technicians, school or college leaders, employers, STEM Ambassadors and researchers doing some of the most incredible science, engineering or technology – I could go on. Whether it's meeting one of our 30,000 STEM Ambassadors, or on a recent trip to CERN with the 2016 STEM Inspiration award winners, I'm always learning something new, and being challenged to think differently. Scientists, engineers, technologists and mathematicians – as teachers or working in a huge variety of industries – all work increasingly in multi-disciplinary teams, drawing on others' knowledge, skills and ideas to achieve results.

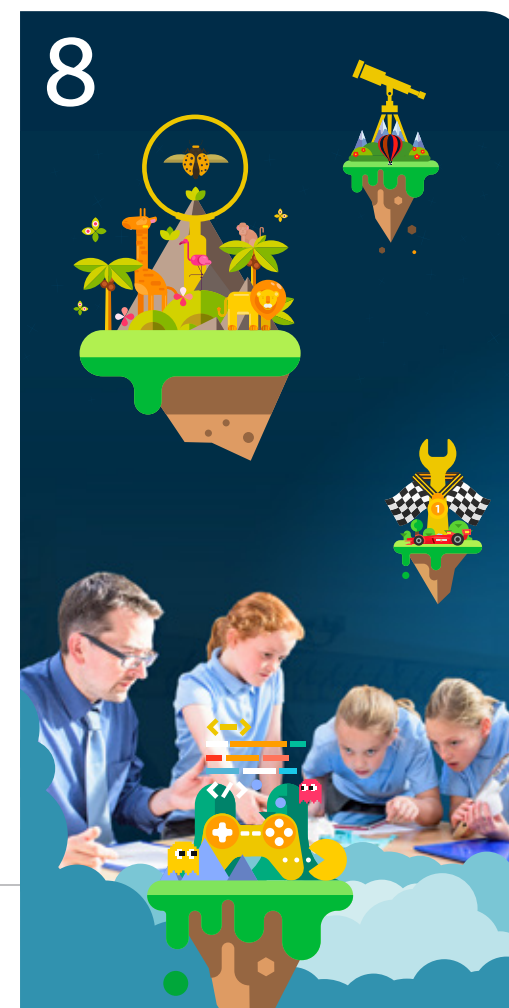
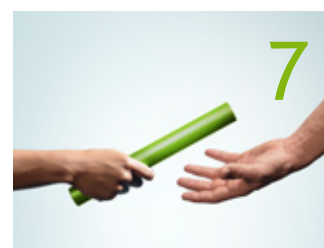
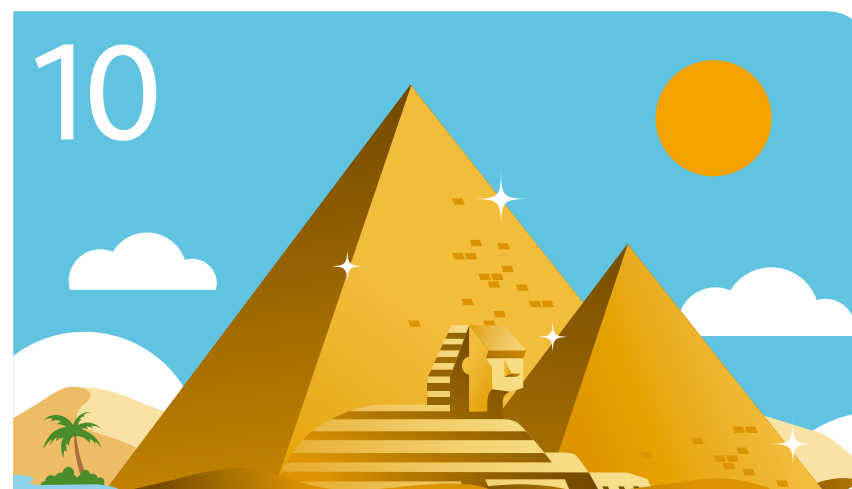
I was delighted to see another organisation committed to supporting teachers, the Chartered College of Teachers, recognised with a Royal Charter last year. Run by their members, for their members, the Chartered College of Teachers aims to promote the professionalism of teaching.

Collaboration is the future - we can find inspiration from each other and from individuals, employers and other organisations supporting education across the UK. So this term, why not challenge yourself to reach out and connect? Come and learn with our experts on bursary-supported CPD at our Centre in York; connect with your local Science Learning Partnership; invite a STEM Ambassador into your school; or work with an employer or university through our STEM Insight programme. You might be surprised about the impact this could have on you, your colleagues - and most importantly - your pupils.

*Yvonne Baker*

YVONNE BAKER, CHIEF EXECUTIVE, STEM LEARNING

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# Working scientifically for all children

by **KAREN BRUNYEE**

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Primary Professional Development Lead, National STEM Learning Network



One of the defining features of science is how it naturally caters for all learning styles. Science provides children with the opportunity to experience different materials, concepts and phenomena in a hands-on way that facilitates their language and understanding, and has been found to help children remember concepts longer than if they'd had no physical experience.

## DEVELOP AWARENESS OF WORKING WITH SEND CHILDREN >

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

Special Educational Needs: STEM resources  
■ [www.stem.org.uk/lx9q48](http://www.stem.org.uk/lx9q48)

Supporting SEND pupils in primary science  
■ [www.stem.org.uk/ny043](http://www.stem.org.uk/ny043)

It is a real shame that often those children who would most benefit from the hands-on investigative nature of science are often the ones removed from lessons for 'catch up' sessions in other subjects.

Around 14% of the population of school children in England are classed as having special educational needs and disabilities (SEND). This can be anything from a moderate learning difficulty to those children who have severe and complex disabilities and everything in between.

There is so much scope for our children with SEND to access practical science where they may struggle with other areas of learning. I have worked with children who presented with Asperger's and refused to take part in writing activities. However, they have held critical debates with me about scientific concepts which challenged my own beliefs. Another child with a visual impairment led an investigative activity where she was able to use her excellent communication skills to describe the groups' findings.

Children who displayed challenging behaviour when seated at a desk, worked together and challenged themselves when given the freedom to design their own investigations. By providing alternatives to written work for children who find writing a challenge, the level of participation in communicating their understanding increased dramatically. I will always remember the 'habitat rap' performed by a group of particularly quiet Year 5 boys.

During practical activities children are constantly talking to each other. You will gain a very accurate assessment of a child's scientific understanding

from the conversations you hear while they are immersed in an engaging activity. A written report may fail to convey this, as the children may have forgotten what they did and will not report the ideas and asides they had while engaged in the task. An annotated photograph is excellent evidence of the children's work and is better than a cloze procedure where the outcome is just remembering the correct word.

SEND should not be a barrier to children working scientifically and there are lots of ideas to help these children make the best of their science education. Lots of modelling, drama and hands-on work is essential, as is not overloading the children with too much new vocabulary or concepts at the same time. Let them experience new concepts, equipment and vocabulary at their own pace.

## SCIENCE FOR ALL

Andy Burrough and Joelle Halliday at Sheffield Hallam University have been involved in a project called Science For All. It looked at how special schools have engaged their children in science lessons. They have put together presentations for different aspects of working scientifically with photographs and videos of the children engaging in the learning. The original project worked with Key Stage 3 children with a primary phase coming together later this year.

Science for All resources  
■ [www.stem.org.uk/cx5s7](http://www.stem.org.uk/cx5s7)

# Supporting newly qualified teachers

by **SARAH DAGNELL**

@sarahdagnell

Primary Professional Development Lead, National STEM Learning Network

Newly qualified teachers (NQTs) bring a wealth of enthusiasm and new ideas. They are buzzing with the energy to engage and inspire generations. However, teaching can soon become overwhelming as they face the never-ending tasks that the job entails. Many talk about drowning under piles of marking, planning and paperwork. Most are not prepared for these stresses and the hours of work.

2015 brought the worrying statistic that four out of ten NQTs leave within their first year of teaching. The 62% retention rate was slated as 'dismal' by the Association of Teachers and Lecturers (ATL) general secretary, Dr Mary Bousted. So what can we do to support and nurture our new teachers to give them the best possible start?

“The first year (of teaching) is the most formative period in a teacher's career and support is crucial if they are to develop the competencies, confidence and attitudes that will keep them happy and successful in the job. Induction should ensure that professional and career development has a firm foundation because it gives new teachers opportunities to become successful in teaching and begin to make a real impact on school development.”  
- Bubb, 2007



## A REDUCED TIMETABLE

Is a statutory requirement. This is essential time to help manage planning, preparation and marking as well as time for development. Observations of others, visits to other schools and other CPD opportunities can be organised.



## OBSERVATION OF OTHERS

There are no better people to learn from than our colleagues. So when areas of development become clear, allow some time for NQTs to observe others.



## AN EXPERIENCED MENTOR

Gives NQTs a friendly face they can come to for advice and help. A mentor will be able to guide a new teacher through some of the pitfalls of teaching and direct them towards people and places that can offer support. They also give NQTs constructive feedback about their teaching and help to provide opportunities for development.



## TIME SPENT WITH SUBJECT COORDINATORS

Knowing where to find resources and who to go to for help can be invaluable and save NQTs hours of time.



## PROFESSIONAL DEVELOPMENT

There are a wealth of opportunities out there. Some are specific to NQTs and others could be addressing areas of development. Attending CPD not only allows a teacher to learn new things from the course itself, but also to network with the other teachers, picking up ideas and contacts.



## TEAM PLANNING AND TEACHING

NQTs often appreciate time to work together to get to grips with new systems and generate ideas. Team teaching allows chances to pick up teaching tips as well as having a supporting hand to get the most out of children. NQTs benefit from a chance to learn from an experienced colleague who in turn discovers new and engaging ideas from the NQT.



## TALK

Put the kettle on, grab a biscuit and just have some time to talk, either in person or by joining an online community.



# Assessing mathematics without levels

by **ALISON HOGBEN**

@AlisonHogben

Teacher, Springhead Primary School and  
Specialist Leader in Education in Primary Mathematics

A few years down the line from the removal of levels in primary schools, are you still trying to understand how to demonstrate your children's progress across the curriculum? At first, many schools rushed to buy materials which transpired to be just levels by another name. However, there is another way!

As the subject leader in my school, I spent time with colleagues considering a model which provided accurate, useful information about children, that improved teaching and learning and that ensured children knew how to make progress. I felt published tests only provided a snapshot of what a child could or couldn't do on a particular day, so I wanted something that would provide a bigger picture about the depth of a child's understanding. It needed to meet all of the aims of the national curriculum – to assess fluency, application to problem solving and children's use of reasoning.

After much trialling and refining, I developed a set of generic skills criteria, based on the AT1 Using and Applying skills. Teachers have a structure that they use to assess children through a range of questioning, conceptual understanding activities, the use of procedural variation, through application and greater depth challenge.

**At a basic level, children who are working below age-related expectations can:**

- practise and recall facts and skills (ie curriculum objectives)
- use objects and mathematical manipulatives, pictures and simple recording to represent concepts
- start to talk about their work
- solve simple problems with support

Special educational needs (SEND) children are able to use the same criteria but work at a level more appropriate to their needs.

**Those working at age-related expectations can:**

- apply facts and skills to problems and investigations, identifying what they need to know and what they need to be able to do in order to solve problems
- represent their work in a variety of ways
- describe and explain their work using mathematical language to reason
- make connections and links between mathematical ideas

**Children working at greater depth can:**

- work independently to choose ways to tackle and solve problems of greater complexity
- present work in a clear and organised way, choosing appropriate methods of recording
- explain work clearly and accurately using mathematical language



- use reasoning to make predictions, conjectures and generalisations and ask their own questions
- use their maths skills confidently in a variety of contexts, including cross-curricular tasks

Each 'level' is given a child-friendly name and written as child-friendly statements so that learners can understand which mathematical skills they are competent in as well as having clear targets for progress.

Working with your colleagues to develop your own assessment and progression framework is the best way forward. You can design it for the children in your own school and decide what are the most important aspects and which will have the greatest impact on learning and teaching.

## DEVELOP YOUR ASSESSMENT SKILLS >

Assessing, moderating and tracking primary mathematics  
■ [www.stem.org.uk/my032](http://www.stem.org.uk/my032)

Assessing, moderating and tracking primary science  
■ [www.stem.org.uk/ny032](http://www.stem.org.uk/ny032)

Assessment in primary computing  
■ [www.stem.org.uk/cy032](http://www.stem.org.uk/cy032)

Assessment and progression in primary science  
■ [www.stem.org.uk/rp102](http://www.stem.org.uk/rp102)

Primary mathematics resource packages  
■ [www.stem.org.uk/mp/primary-maths](http://www.stem.org.uk/mp/primary-maths)

# From primary to secondary: preventing the clean slate approach

by **CHARLOTTE BUNN**

@AHSYork

Primary Science Coordinator, Archbishop Holgate's School



The transition from primary to secondary school is a significant point in a child's education and means some major changes for all children. Most will be better able to cope with these when there is preparation in the form of transition work. A focussed transition plan avoids the need for a 'clean slate' approach where a secondary school starts again with science teaching, assuming that the incoming pupils know little about science or that what they do know is so variable that it would be better to start from scratch.

At Archbishop Holgate's we work with our feeder schools in a joint and collaborative approach throughout the year to try to bridge primary to secondary science. We plan for a range of opportunities that includes visits to the primaries with specialist equipment to give pupils a chance to undertake new practical experiments. The focus on practicals continues when the pupils visit the secondary site. We get them into the labs for a lung or eye dissection demonstration or using chemicals.

This gives pupils an insight into what the labs are like and what to expect when they join the school.

Taster mornings where children meet pupils from different schools help them to begin to develop new friendships, which has a positive effect on self-esteem and confidence. Teacher focussed sessions are also useful, to share and develop resources and ideas around delivering science.

Keep in touch with the use of regular newsletters. The content can be aimed at both parents (in terms of school achievements and updates to keep them informed) and also the engaged child (by providing fun competitions and activities).

Whatever you plan with the secondary schools you feed into, the broader the range of experiences, the easier your children will find settling in to their new science environment at key stage 3 and the further they might go with their science education.

## MAKE THE TRANSITION AS EASY AS POSSIBLE >

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

Developing the role of the primary science subject leader  
■ [www.stem.org.uk/rp101](http://www.stem.org.uk/rp101)

## FIVE STEPS TO ENSURING TRANSITION SUCCESS:

### 1. Invite secondary science teachers to observe your science lessons.

Offer them the opportunity to come in and observe your class to help them understand what the children have covered and what assessment you've done.

### 2. Let them talk to the children.

Meeting the pupils before they come into the secondary science classroom will be hugely beneficial to the teachers. It's a great chance to see the children interact verbally – some pupils struggle with written work but are brilliant when explaining things out loud.

### 3. Share your pupils' work books.

To give secondary teachers a real insight, let them have a look at your pupils' work books. This way they can see what stage your pupils have reached in their written science knowledge.

### 4. Continue the conversation.

Talk regularly to your secondary contacts. Ask each other questions, discuss curriculum coverage and what assessments your pupils have done.

### 5. Have a transition day with other feeder schools.

This gives your pupils the opportunity to mix with new classes and experience what a secondary science lesson will be like. It also gives the secondary school teacher a better idea of what to expect and the time to plan ahead instead of starting from scratch.



# Myth busting: talking careers at primary school

by **DR AJAY SHARMAN** STEM Ambassador Liaison Lead, National STEM Learning Network

I was recently asked why I chose to be a scientist and when I made this decision. It was the moment in secondary school when my chemistry teacher, Mr Harradine, decided to almost blow up the laboratory, making water by igniting a spark between hydrogen and oxygen that made me realise there was some value in exploring the world of the weird and wonderful.

As a STEM Ambassador myself, going into a primary school and asking children to draw a scientist and tell me what they do, made me realise how little has changed. Stereotypes persist; white coats, long beards, potion-wielding doctors and drill-threatening dentists seem to be the order of the day. We need to address these stereotypes and ignite interest in STEM careers at a younger age.

It struck me: kids of this age don't understand the word 'careers'. They need simple phrases they can relate to...ie what job do you do? What kind of jobs have you seen or read about? Suddenly, the change in question gives a slightly different answer! The myths are busted when you talk through your job. For example, medicines they recognise from when they are unwell, which a healthcare scientist has been responsible for developing, or a train they have travelled on that a rail engineer operates, or even a TV broadcast the children have watched that a technical engineer they meet has played a part in creating.

With the increasing interest in science on TV, like the BBC Terrific Scientific campaign for primary schools and even schools' involvement in Tim Peake's Principia mission, one would imagine that primary school children would have a better understanding of scientific jobs. Well in part, maybe. But what truly makes a difference is meeting a real rail engineer, a real healthcare scientist or a real technical media expert. The value of the STEM Ambassador programme is that primary school children are able to ask real people what they do, how did they get to what they do and, of course, the killer question, how much do you get

paid? At my last engagement with a primary school I was even asked what car I drove as part of my job!

There are lots of primary schools who are currently doing great work to get their children engaged in STEM careers. In Swingate Primary School in Kent, for example, This Girl Can activities, involving parents and children, brought STEM Ambassadors in to inspire young girls about mathematics in the workplace. It also showed the girls, their mothers and their grandmothers that girls can grow up to have a STEM job that they love.

The Star Primary School in Canning Town, London, hold an annual 'jobs fair' for their pupils. The fair is open to all pupils between the ages of 5 and 11 and engages STEM Ambassadors from a broad range of sectors so the children can learn more about STEM jobs.

At the Discovery Park in Sandwich, an annual East Kent Science Jamboree hosts workshops to inspire the next generation of scientists, delivered by a range of STEM Ambassadors. Year 6 children take part in bite-size workshops and experiments, designed to spark an interest in science subjects and complement their curriculum, while asking direct questions about the jobs STEM Ambassadors actually do, every day of their lives.

There are plenty of opportunities for teachers to access primary careers support. There are STEM careers toolkits, which include good practice tips with in-depth sources of resource information. You can access STEM Ambassadors who are role models from industry and research organisations giving young children an understanding of the

broad range of jobs that may excite and inspire them to consider a future STEM work-life. The Primary Engineers programme links children with inspiring role models, like STEM Ambassadors, interviewing them and then writing up the experience, thereby supporting literacy too.

So how do we help engage those without STEM backgrounds, including primary teachers, careers advisers (who could be one and the same in primary schools) and, even more critically, parents, as key influencers? By being passionate and supportive. By facilitating good primary teacher CPD support, widening girls' and boys' perceptions of STEM related jobs through informal and formal engagements with inspiring professionals like STEM Ambassadors. Getting young people's parents and carers involved will help build a solid foundation to help young people climb the STEM ladder of life experiences. Crucially, we need to broaden support and offer a multitude of opportunities that challenge young peoples' perceptions of the STEM world of work.

## LAUNCH INTO OUR CAREERS RESOURCES >

Careers toolkit  
■ [www.stem.org.uk/cx57dq](http://www.stem.org.uk/cx57dq)

STEM Ambassadors  
■ [www.stem.org.uk/mp/stem-ambassadors/ambassadors](http://www.stem.org.uk/mp/stem-ambassadors/ambassadors)

# Don't miss out science – teach it through cross-curricular topics

by **RACHEL JACKSON** Primary Specialist, National STEM Learning Network

Topics are an excellent way to teach science as part of a broad and balanced curriculum. Many schools deliver the entire curriculum through the use of topics or themes for learning, whereas others look at integrating two or more subjects across the curriculum. However you choose to do it, the use of an engaging topic can provide a stimulating context for learning science and working scientifically. It also supports children in making connections across subjects, and can enrich learning and provide opportunities for developing thinking and reasoning skills and creativity.

## WORKING SCIENTIFICALLY THROUGH TOPICS

Why children need to work scientifically and how they can

■ [www.stem.org.uk/rp107](http://www.stem.org.uk/rp107)

Engaging science in Key stage 1

■ [www.stem.org.uk/rp109](http://www.stem.org.uk/rp109)

Space and astronomy - a context to teach science from year 1 to year 6

■ [www.stem.org.uk/ny017](http://www.stem.org.uk/ny017)

## GET CREATIVE

A lovely, yet straightforward example linking science and art is where children look at a variety of different fruit, including tropical fruit, and predict what a fruit will look like inside. Children can draw their predictions, including what seeds may look like, the pattern of seeds and the colour of the fruit on the inside. Fruit is then cut open, lengthwise or through the middle, to expose different views of the inside. Close observational drawing of the cut fruit can then be made using pencil, chalk, oil pastels or paint.

Apart from the links to parts of a plant and plant reproduction, the seeds can be collected and used in a thinking skills lesson. Challenge children to sort unknown seeds using different criteria and think about which fruit they may have come from.

## WORLD WAR II

When learning about bombing raids in WWII, discuss the use of blackout blinds and research what people used. Then investigate the best material to create a blackout blind and use data loggers to measure the effectiveness of the different materials at blocking out light. Link to the phases of the moon by learning about RAF nicknames for the phases such as 'Bomber's Moon'. On numerous occasions famous battle dates were set in order to take advantage of the certain phases of the moon. Ask children which were likely to be used for bombing raids. Can they find out when the next 'Bomber's Moon' will be?

Discover how during this war periscopes on submarines were used to see targets above the surface of the water. Get children designing and making their own periscope to look around the corners of the classroom, then explain how they work.

## ANCIENT EGYPT

When learning about Egypt, mummification never fails to delight. Finding out about the process and the changes which occur over time might be a little gruesome, but you can try mummifying some fruit, such as a tomato. This will help give some insight into mummification and provide a great opportunity for making detailed observations over time.

Link work on friction to how the heavy stones used to build the pyramids were moved. This in itself provides scope for thinking and reasoning. Challenge children to move a heavy object over a distance (not too heavy though!) and see what they come up with. Children can investigate dragging a small wooden object over different surfaces using newton metres to measure how much force is needed to move the object. They could also explore ideas to reduce the friction and make it easier to pull the blocks along.

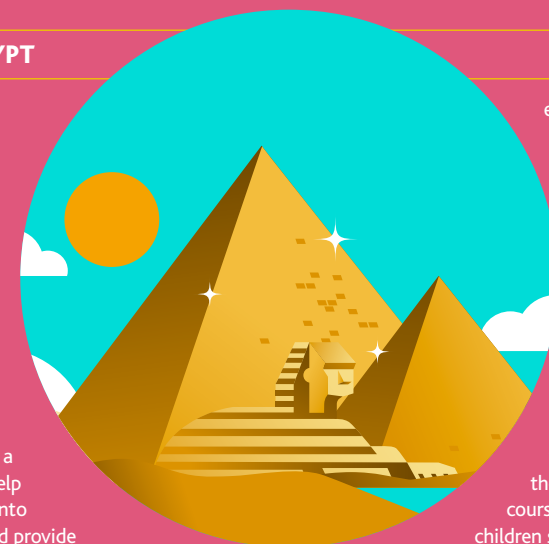
The ancient Egyptians divided days into generally agreed-upon equal parts, and a sundial was discovered in the Valley of the Kings in 2013. This provides a great context to learning about

earth, space and light. Carrying out an investigation looking at sundials and shadows allows children to see that light travels in a straight line and is blocked by the sundial forming a shadow. Investigating what happens to the shadows over the course of a day will help children see that shadows change in length and position through the day. They can then, like the Egyptians, think about what they have observed and reason why this might be.

If you're learning about any of the ancient civilisations then you could try and create some lovely fake poo to stimulate enquiry about what people from the past ate. This can lead into work on the digestive system and comparing modern-day diet with that of ancient civilisations. Create models to show how the digestive system works, using food (chocolate cake works well), a bag for the stomach, a pair of tights for the intestines and a very good sense of fun! Let your imagination run wild on how to model the action of the teeth, stomach acid and bile. Alternatively get the children to research it then come up with their own models.

There are many ways to include science in topic-based learning and drive thinking and reasoning skills across the curriculum. Head to [www.stem.org.uk](http://www.stem.org.uk) to see the new topic-based learning area we've put together to support teachers in making links from topics to science learning. You'll find lots of ideas and resources to stimulate working scientifically.

■ [www.stem.org.uk/mp/cross-curricular-topics-resources](http://www.stem.org.uk/mp/cross-curricular-topics-resources)





# A sneak peek at our summer primary conferences

Conferences are great places to find new ideas and approaches to take back to your school.

The National STEM Learning Network is hosting a series of primary conferences this summer. Whether you're an early years teacher, subject co-ordinator or class teacher there's something for everyone. Take a quick look at some of the things you can expect.

## SCIENCE CONFERENCE

WEDNESDAY 28 JUNE  
[www.stem.org.uk/ny007](http://www.stem.org.uk/ny007)

### SCIENCE AND TALK

Helping children to develop a strong scientific vocabulary is fundamental to enabling children to communicate their scientific understanding, assimilate new ideas into existing thinking, to challenge misconceptions and to create new understandings. Come and find out about a range of games and strategies to support children as they practise speaking scientifically and developing their skills of explanation.



### STORIES AND SCIENCE

Stories can provide excellent problems or scenarios for scientific enquiry and also enable children to walk around a scientific concept. We will be looking at a range of story types, exploring how we can learn about working scientifically through biographies, imagining new possibilities through fiction and use poetry or drama to communicate new ideas.

### SUPPORTING ASSESSMENT

Explore a new resource that has been developed in collaboration with schools. The aim is to help teachers be clearer about the meaning behind the national curriculum statements so that they can plan effective lessons and ensure that children meet the required standard. The resource also includes materials drawn from children's work and other evidence gathered during lessons that demonstrate what meeting the objectives may look like.

### EARLY YEARS: DEEPENING UNDERSTANDING

Forest schools offer learners the opportunity to develop confidence and self-esteem in a woodland environment. Few would dispute the benefits of this child-led approach to learning, which promotes independence, exploration and curiosity. In this session, we will explore ways in which different aspects of the primary science curriculum can be covered using a forest school approach to learning. This will be an introduction to the forest school ethos and will give you practical ideas that you can replicate in your own school grounds.

## MATHEMATICS CONFERENCE

THURSDAY 29 JUNE  
[www.stem.org.uk/my007](http://www.stem.org.uk/my007)

### EARLY YEARS: DEEPENING UNDERSTANDING

This workshop will explore the learning from a two-year Maths Hub project exploring approaches to learning number and calculation through the foundation stage. We'll focus on developing practitioners' subject and pedagogical knowledge and how to ensure that children have strong conceptual understanding of the underlying mathematical principles they need to be ready for the mastery curriculum.



### PROBLEM SOLVING

Problem solving is a key part of the curriculum, so how can we support all children to become resilient and tenacious problem solvers? We'll explore a range of strategies and ways of working that strengthen children's approaches to problem solving. We'll also look at some high-quality resources to support teachers in enabling children to become confident problem solvers.

## COMPUTING CONFERENCE

FRIDAY 30 JUNE  
[www.stem.org.uk/cy007](http://www.stem.org.uk/cy007)

### GOING FURTHER WITH SCRATCH

Scratch is used widely in many primary schools, but this session will take it further. We'll explore how Scratch can be used to stretch the more able children, as well as a wider consideration of how it may fit into your programme of study. This will include creating games and ways Scratch can be linked to the physical world.

### PLANNING AN EFFECTIVE PROGRAMME OF STUDY



Now that the curriculum has become more solidly embedded, we will find ways that you can move your computing teaching to the next level. This involves finding outstanding ways to teach computational thinking and helping your children be better problem solvers. We'll look at using computing with or without computers and how it can be embedded in the wider curriculum.

### MICRO:BIT

The micro:bit was the biggest BBC education project in 30 years and has taken lower secondary by storm. Hugely popular in primary schools, it is simple to use, needs no software and has a huge number of interesting project ideas across many subject areas to support digital literacy. STEM Learning is the home of teacher support for micro:bit, so come to this session to find out more about how to bring the micro:bit into your classroom. This will include examples of easy programming of wearable tech, robots and flashy lights!

## ESERO-UK CONFERENCE

WEDNESDAY 31 MAY  
[www.stem.org.uk/sv005](http://www.stem.org.uk/sv005)

### DISCOVER HOW SPACE CAN BE AN EXCITING WAY TO TEACH STEM SUBJECTS

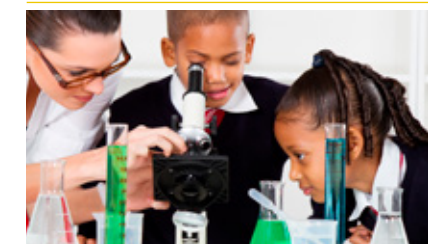


Engage in activities linked to ESA's (European Space Agency) ExoMars mission, Tim Peake's mission to the International Space Station and the upcoming James Webb Space Telescope.

## SCIENCE LEARNING PARTNERSHIP CONFERENCE

BROWSE DATES AND VENUES ONLINE  
[www.stem.org.uk/rp124](http://www.stem.org.uk/rp124)

### FIND A SCIENCE CONFERENCE NEAR TO YOU



Discuss current good practice in primary science, recognise your own good practice and identify areas for development and reflect on ways to translate ideas to your school context.



# Strategic use of CPD: my wish list for 2017

by **FRAN DAINTY** Head of Content and STEM Expertise, National STEM Learning Network

Empowered, inspiring and highly effective teaching and support staff.....



Pupil engagement, achievement and progress are on track to reach record highs.....



Successful recruitment of high quality staff.....



So, as a head teacher how do you achieve, and more importantly, sustain this?

The key is in your approach to a highly personalised CPD strategy defined by both you and those that you lead or manage. Establishing a climate where teachers can both collectively and individually identify specific areas of their own development will create a forward thinking, motivated and highly skilled staff. They will feel empowered to select and plan their own personalised and high impact CPD that will meet their demands.

The Teacher Standard for CPD, published last year, clearly defines the role and responsibility of teachers and leaders in providing opportunities for CPD. This is a powerful tool in providing guidance and informing your CPD strategy and sourcing high impact, evidence-based CPD, which is subject specific and cutting edge, is easier than you think!

Teachers will always have individual needs and targets to meet alongside those of the whole school. Retention and development of teachers must be addressed and clear pathways of support must be easily accessible, affordable and guarantee impact on both self, colleagues and children if they are to leave the classroom for any period of time. So as a head teacher or line manager how do you establish a culture where teachers feel valued, inspired and empowered to take their lessons to the next level?

**1** Ask teachers to carry out a regular audit or needs analysis of their individual, subject-specific areas of development and identify, together, which areas would have the greatest impact on achievement of your children. Then act on them!

**2** Establish the career aspirations of your individual team members early on and identify opportunities both within the school and beyond that will develop potential and empower teachers to improve their expertise and leadership.

**3** Promote peer mentoring across the school to utilise the expertise and support already there. This will have great benefits for all staff involved and will strengthen teams and boost morale.

**4** Celebrate even the smallest successes and achievements so that staff feel valued and their efforts are recognised. In the fast-paced environment of a school this can be overlooked, but the power of a 'well done' cannot be underestimated.

**5** Provide opportunities for staff to learn and develop their subject expertise together. This could be engaging in CPD such as an online course, around a particular area – behaviour, assessment, differentiation, non-specialisms – or bespoke CPD using local or national expertise.

## CPD AT EVERY STAGE

### MOVING TO OUTSTANDING

Assessing, moderating and tracking primary science  
■ [www.stem.org.uk/ny032](http://www.stem.org.uk/ny032)

Developing an outstanding primary science curriculum  
■ [www.stem.org.uk/ny044](http://www.stem.org.uk/ny044)

Linking core subjects; science and mathematics  
■ [www.stem.org.uk/rp113](http://www.stem.org.uk/rp113)

Raising attainment in science  
■ [www.stem.org.uk/rp103](http://www.stem.org.uk/rp103)

Supporting SEND pupils in primary science  
■ [www.stem.org.uk/ny043](http://www.stem.org.uk/ny043)

Teaching primary science outdoors  
■ [www.stem.org.uk/ny009](http://www.stem.org.uk/ny009)

### ASPIRING LEADERS

Developing the experienced primary science leader  
■ [www.stem.org.uk/ny003](http://www.stem.org.uk/ny003)

Developing the role of science subject leader  
■ [www.stem.org.uk/rp101](http://www.stem.org.uk/rp101)

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

Improving numeracy and literacy through science  
■ [www.stem.org.uk/ny036](http://www.stem.org.uk/ny036)

Leading the new primary computing curriculum  
■ [www.stem.org.uk/cy004](http://www.stem.org.uk/cy004)

New and aspiring primary science specialist  
■ [www.stem.org.uk/ny010](http://www.stem.org.uk/ny010)

New to leading primary mathematics  
■ [www.stem.org.uk/my004](http://www.stem.org.uk/my004)

Primary science subject leaders' network  
■ [www.stem.org.uk/rp121](http://www.stem.org.uk/rp121)

### NEWLY QUALIFIED

Developing your practice in the early years foundation stage  
■ [www.stem.org.uk/ny012](http://www.stem.org.uk/ny012)

Primary STEM for newly and recently qualified teachers  
■ [www.stem.org.uk/ny015](http://www.stem.org.uk/ny015)

Strengthening subject understanding in...  
■ [www.stem.org.uk/rp112](http://www.stem.org.uk/rp112)

Space and astronomy - a context to teach science from year 1 to year 6  
■ [www.stem.org.uk/ny017](http://www.stem.org.uk/ny017)

Why children need to work scientifically and how they can  
■ [www.stem.org.uk/rp107](http://www.stem.org.uk/rp107)



# See it, do it, teach it!

## Immerse yourself in the world of STEM



Our STEM Insight programme gives you the opportunity to experience STEM in the workplace or at university. Go on a placement with a leading UK STEM employer or university department and develop your knowledge of STEM jobs. The perfect opportunity to support your pupils' learning with real life experiences and to ignite in them a lifelong passion for science, technology, engineering and mathematics.

### FIVE REASONS YOU SHOULD TAKE PART IN STEM INSIGHT:

1. It supports your teaching by giving you real-life experiences to contextualise your lessons
2. You will get up to date STEM-related careers knowledge
3. Develop links with a local employer or university
4. We work with you to give you exactly what you need
5. It is bursary funded

[STEM Insight] inspired me to have the confidence to go beyond my own expectations, and achieve results which, quite frankly, have astounded me.

— Rose Russell,  
STEM Insight participant

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

## CALENDAR

# Our top picks for you to put in the calendar...

MAY 2017

EDITOR'S  
TOP  
PICK



**WORLD TURTLE DAY**  
23 MAY 2017

Did you know only about 1 in 1,000 baby turtles make it to maturity? World Turtle Day takes place annually on 23 May and aims to raise awareness and celebrate these amazing creatures.

Find out how you can bring World Turtle Day into the classroom:  
■ [www.stem.org.uk/mp/blog/bringing-world-turtle-day-classroom](http://www.stem.org.uk/mp/blog/bringing-world-turtle-day-classroom)

JUNE 2017



**WORLD ENVIRONMENT DAY**  
5 JUNE 2017

Protecting nature and the planet is vital, which is why World Environment Day is observed every year. The theme for this year is 'Connecting People to Nature' and aims to get people outdoors and appreciate its beauty and importance.

■ [www.worldenvironmentday.global](http://www.worldenvironmentday.global)



**ASTEROID DAY**  
30 JUNE 2017

Asteroid Day is a global awareness campaign where people from around the world come together to learn about asteroids and what we can do to protect our planet.

■ [www.stem.org.uk/rxxa2](http://www.stem.org.uk/rxxa2)

JULY 2017



**ENTHUSE CELEBRATION  
AWARD CEREMONY**  
20 JULY 2017

Designed to recognise the impact that teachers, technicians and support staff have on pupils, colleagues and schools, the ENTHUSE Celebration Awards take place annually. This year, there are a number of regional events taking place all around the UK, with the national final taking place at the Houses of Parliament in July.

■ [www.stem.org.uk/mp/enthuse-celebration-awards](http://www.stem.org.uk/mp/enthuse-celebration-awards)

## SOCIAL MEDIA

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

**@STEMLearningUK**  
Followers: 25K

**@FitzzSarah**

Wow, the library in the @STEMLearningUK centre is amazing!! So many fantastic resources for doing STEM in schools

**@AshcroftAcademy**

Four students are travelling to CERN today to see the Large Hadron Collider as a prize for best STEM club in England. Enjoy your day!



**@Mjogalvin**

@yvonnebaker 2 of my team saying what fantastic CPD they had at STEM centre. 'Best ever', 'life changing' wow! @STEMLearningUK

**@glanymorStem**

Just arrived, ready for an exciting day tomorrow @CERN, added bonus snow on the ground! @STEMLearningUK #STEMInspirationAwards

**@horsfall3d**

I visited the National #STEM Learning Centre today. A unique building with an inspirational collection of resources @STEMLearningUK



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



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

Teachers or technicians 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.



# Plan your autumn term CPD

We believe all young people across the UK should receive a world-leading STEM education. We work towards our vision by making it easy for teachers and others involved in STEM education to access subject-specific, quality-assured CPD, so they can teach effectively and inspire the young people with whom they work.

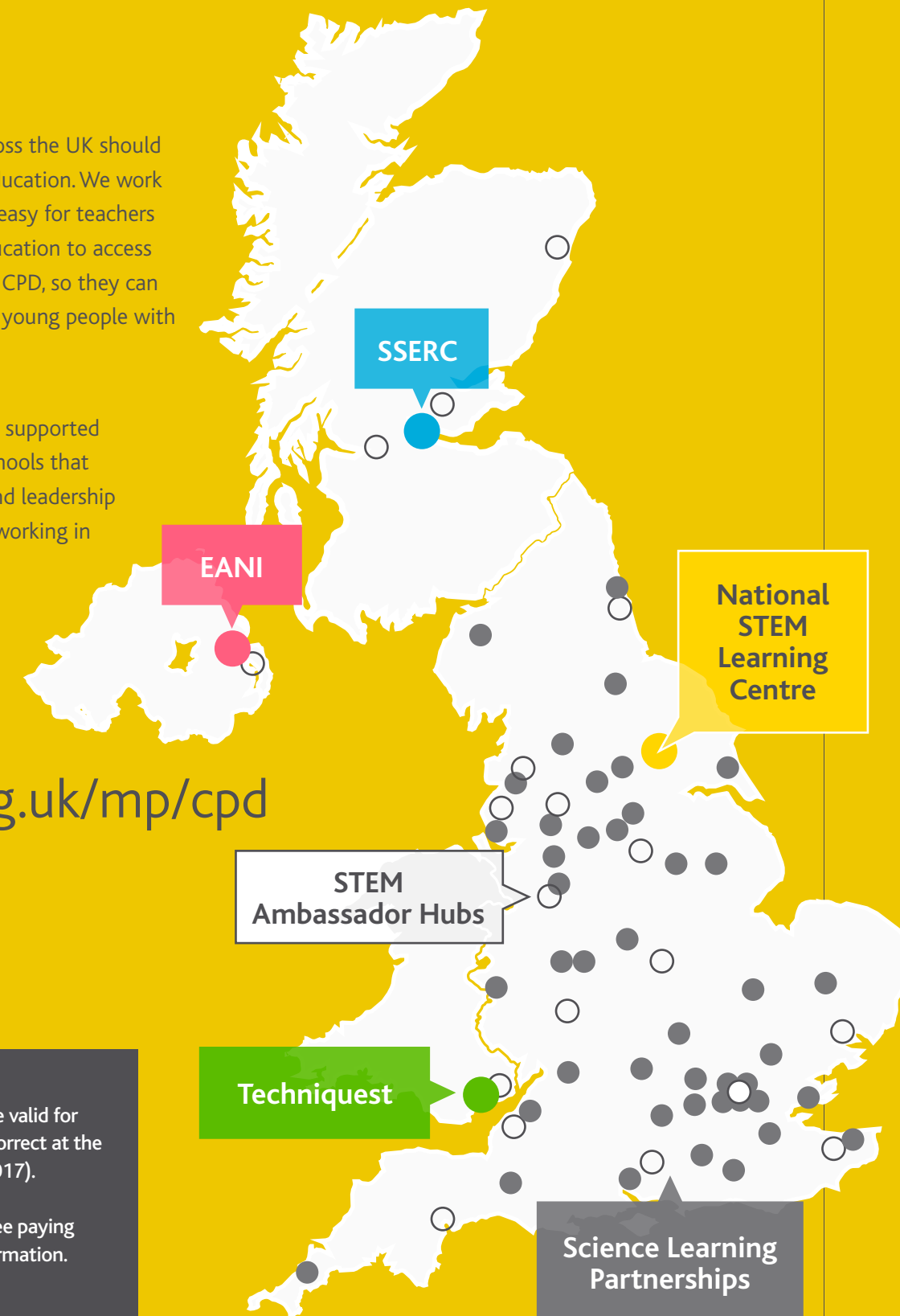
We provide high impact, bursary supported professional development for schools that improves subject, pedagogical and leadership skills and knowledge for people working in STEM education.

You can access our CPD nationally, locally and online.

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

All fees and award values are valid for state-funded schools and are correct at the time of print (March 2017).

See [www.stem.org.uk](http://www.stem.org.uk) for fee paying schools and the latest information.





COMPUTING

INTENSIVE SUBJECT-SPECIFIC CPD  
Accommodation and meals included

ASSESSMENT AND PROGRESSION  
IN PRIMARY COMPUTING

Starting with assessment theories we will investigate different methodologies for making judgements on progress and develop decision making around appropriate next steps for learning.

- Your school receives £600 ENTHUSE Award
- Activity fee: £600 (ex VAT)
- 1 Nov 2017 (2 days)

■ [www.stem.org.uk/cy032](http://www.stem.org.uk/cy032)

LEADING THE NEW PRIMARY  
COMPUTING CURRICULUM

Gain a deeper understanding of the aims of the curriculum and develop your own subject knowledge (including developing strategies to teach the 'tricky bits').

- Your school receives £1,200 ENTHUSE Award
- Activity fee: £1,200 (ex VAT)
- 30 Nov 2017 (4 days)

■ [www.stem.org.uk/cy004](http://www.stem.org.uk/cy004)

MICRO:BIT IN SPACE

Learn how to use the micro:bit in the context of space to improve understanding in science and computing.

- Your school receives £300 ENTHUSE Award
- Activity fee: £300 (ex VAT)
- 18 Sept 2017 (1 day)

■ [www.stem.org.uk/cy228](http://www.stem.org.uk/cy228)

SCRATCH: STRETCHING  
THE MORE ABLE CHILD

This course will help you to improve your Scratch programming skills in order to stretch and challenge the children in your class.

- Your school receives £600 ENTHUSE Award
- Activity fee: £500 (ex VAT)
- 25 Sept 2017 (2 days)

■ [www.stem.org.uk/cy011](http://www.stem.org.uk/cy011)

DESIGN AND  
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 Award
- Activity fee: £600 (ex VAT)
- 14 Nov 2017 (2 days)

■ [www.stem.org.uk/ty029](http://www.stem.org.uk/ty029)

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

A beginner's guide to using your mobile device in the classroom. It is suitable for teachers and teaching assistants who are users of iPads, Chromebooks, Android or Windows based devices.

- Your school receives £700 ENTHUSE Award
- Activity fee: £600 (ex VAT)
- 22 Nov 2017 (2 days)

■ [www.stem.org.uk/ty015](http://www.stem.org.uk/ty015)

VEX IQ: INTEGRATING ROBOTICS  
INTO YOUR CURRICULUM

No previous programming experience required, learn how to use VEX IQ in your STEM-related classes and receive your own free VEX IQ Super Kit.

- Your school receives £700 ENTHUSE Award
- Activity fee: £650 (ex VAT)
- 3 Nov 2017 (2 days)

■ [www.stem.org.uk/ty706](http://www.stem.org.uk/ty706)

"This has been a fantastic course - the course leaders and facilitators were very knowledgeable and had an excellent grasp of what works in schools."

- Anne Hill  
Henry Beaufort School

D&T past participant

MATHEMATICS

INTENSIVE SUBJECT-SPECIFIC CPD  
Accommodation and meals included

ASSESSING, MODERATING AND  
TRACKING PRIMARY MATHEMATICS

Starting with assessment theories, we will investigate different methodologies for making judgements on progress, and develop decision making around appropriate next steps for learning.

- Your school receives £900 ENTHUSE Award
- Activity fee: £900 (ex VAT)
- 28 Sept 2017 (3 days)

■ [www.stem.org.uk/my032](http://www.stem.org.uk/my032)

NEW TO LEADING  
PRIMARY MATHEMATICS

Explore the mastery approach to mathematics, develop your skills and knowledge and change the way the subject is taught in your school.

- Your school receives £1,200 ENTHUSE Award
- Activity fee: £1,000 (ex VAT)
- 19 Oct 2017 (4 days)

■ [www.stem.org.uk/my004](http://www.stem.org.uk/my004)

"Excellent presentations on maths mastery. Lots of ideas to take back to school."

- Nicola Hedges  
Middleton-on-the-Wolds  
C of E Primary School

Mathematics past participant

SCIENCE

INTENSIVE SUBJECT-SPECIFIC CPD  
Accommodation and meals included

ASSESSING, MODERATING AND  
TRACKING PRIMARY SCIENCE

Ideal for teachers who want to familiarise themselves with the current expectations around assessment and children's progress in science.

- Your school receives £900 ENTHUSE Award
- Activity fee: £900 (ex VAT)
- 9 Oct 2017 (3 days)

■ [www.stem.org.uk/ny032](http://www.stem.org.uk/ny032)

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 Award
- Activity fee: £1,000 (ex VAT)
- 25 Sept 2017 (4 days)

■ [www.stem.org.uk/ny044](http://www.stem.org.uk/ny044)

DEVELOPING THE EXPERIENCED  
PRIMARY SCIENCE LEADER

Explore best practice and interact with research at local, national and international levels.

- Your school receives £3,150 ENTHUSE Award
- Activity fee: £2,250 (ex VAT)
- 4 Dec 2017 (9 days)

■ [www.stem.org.uk/ny003](http://www.stem.org.uk/ny003)

EMBEDDING WORKING  
SCIENTIFICALLY IN THE  
PRIMARY CURRICULUM

Practical science is essential for inspiring children and teachers alike. You will develop practical strategies to enhance pupils' confidence and learning in primary science.

- Your school receives £900 ENTHUSE Award
- Activity fee: £900 (ex VAT)
- 27 Nov 2017 (3 days)

■ [www.stem.org.uk/ny030](http://www.stem.org.uk/ny030)

HELP! I'M NEW TO LEADING  
PRIMARY SCIENCE

Embed a shared vision for primary science across your school and lead an effective team to ensure good pupil progress.

- Your school receives £900 ENTHUSE Award
- Activity fee: £900 (ex VAT)
- 21 Sept 2017 (3 days)

■ [www.stem.org.uk/ny037](http://www.stem.org.uk/ny037)

NEW AND ASPIRING PRIMARY  
SCIENCE SPECIALIST

This CPD activity will help you develop the skills, knowledge and confidence to become a primary science specialist changing the way science is taught in your school.

- Your school receives £3,150 ENTHUSE Award
- Activity fee: £2,925 (ex VAT)
- 1 Nov 2017 (8 days)

■ [www.stem.org.uk/ny010](http://www.stem.org.uk/ny010)

SPACE AND ASTRONOMY-  
A CONTEXT TO TEACH SCIENCE  
FROM YEAR 1 TO YEAR 6

Get support in planning inspirational science lessons across all year groups, using the Earth and Space element of the National Curriculum.

- Your school receives £700 ENTHUSE Award
- Activity fee: £500 (ex VAT)
- 6 Nov 2017 (2 days)

■ [www.stem.org.uk/ny017](http://www.stem.org.uk/ny017)

SUPPORTING SEND PUPILS  
IN PRIMARY SCIENCE

Focusing on aspects of differentiation and adapting practical tasks for children of all abilities. Sessions will be led by leaders in special needs education.

- Your school receives £900 ENTHUSE Award
- Activity fee: £750 (ex VAT)
- 30 Nov 2017 (3 days)

■ [www.stem.org.uk/ny043](http://www.stem.org.uk/ny043)

TEACHING PRIMARY  
SCIENCE OUTDOORS

Primary science subject leaders and teachers will learn to develop engaging outdoor science lessons to support pupils' progress

- Your school receives £1,200 ENTHUSE Award
- Activity fee: £1,200 (ex VAT)
- 16 Oct 2017 (4 days)

■ [www.stem.org.uk/ny009](http://www.stem.org.uk/ny009)

"Fantastic! A very well structured course, built up carefully over the three days."

- Carol Jeary  
All Saints C of E Primary School

Science past participant

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)

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)

## SCIENCE (CONTINUED)

### 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)

### 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 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)

### USING YOUR OUTDOOR LEARNING ENVIRONMENT

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)

### 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)

**"Excellent subject knowledge. Well planned and led with enthusiasm and clarity. Fully met my expectations and more."**

- John Letts  
St Ethelbert's Catholic Primary School

Assessment and progression in primary science

## ONLINE

### MANAGING BEHAVIOUR FOR LEARNING

Transform your classroom by making small shifts in your own behaviour. Paul Dix, a leading voice in behaviour management in the UK and internationally, will help you learn how to positively influence the behaviour of your pupils through small shifts in your own behaviour.

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

**"I thoroughly enjoyed the course, great resources, relevant information, excellent delivery! Thank you!"**

- Anita Webster

Managing behaviour for learning

**Bespoke CPD tailored to your needs**



Our comprehensive range of support can be requested as a bespoke offer for your school or network. We can make the CPD more effective and tailored to the specific challenges and needs your school faces.

We have a proven track record of highly evaluated, impactful professional development and a wealth of experience in supporting teachers and support staff in all aspects of STEM education.

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



## The impact of our CPD

**97%**

of participants thought the overall quality of CPD was either 'very good' or 'good'



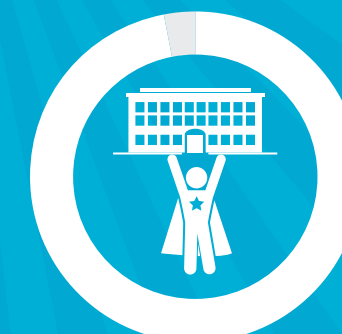
**97%**

of participants thought the CPD was good value for money



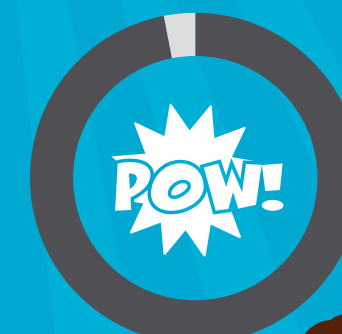
**97%**

of participants expect the CPD to further impact their future practice



**97%**

of participants found the content of CPD relevant and useful to their personal professional needs as well as the needs of their school



**96%**

of participants would recommend our CPD to a colleague





# 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)

