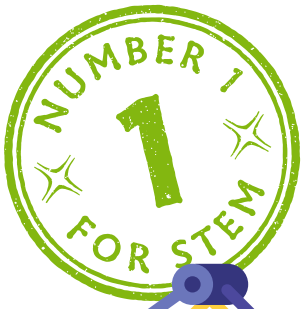
ISSUE 08 • SPRING 2018



secondary and FE
stem LEARNING

The E in STEM

What does it mean to you?

STEM LEARNING

Welcome

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

The start of the Year of Engineering is officially underway and what better way to engage your students 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 students. 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 students 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 or STEM Club.

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 or college. Whatever you are looking for to inspire your students, invigorate your lessons and feel confident and proud that your lessons are having a huge impact, 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.

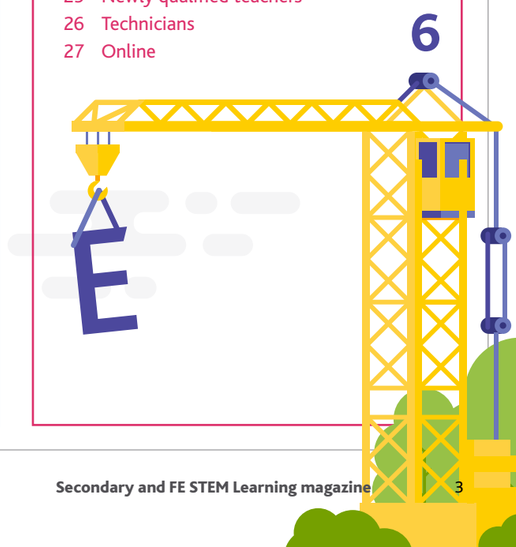
FRAN DAINTY, HEAD OF CONTENT AND STEM EXPERTISE, STEM LEARNING

Contents

FEATURES

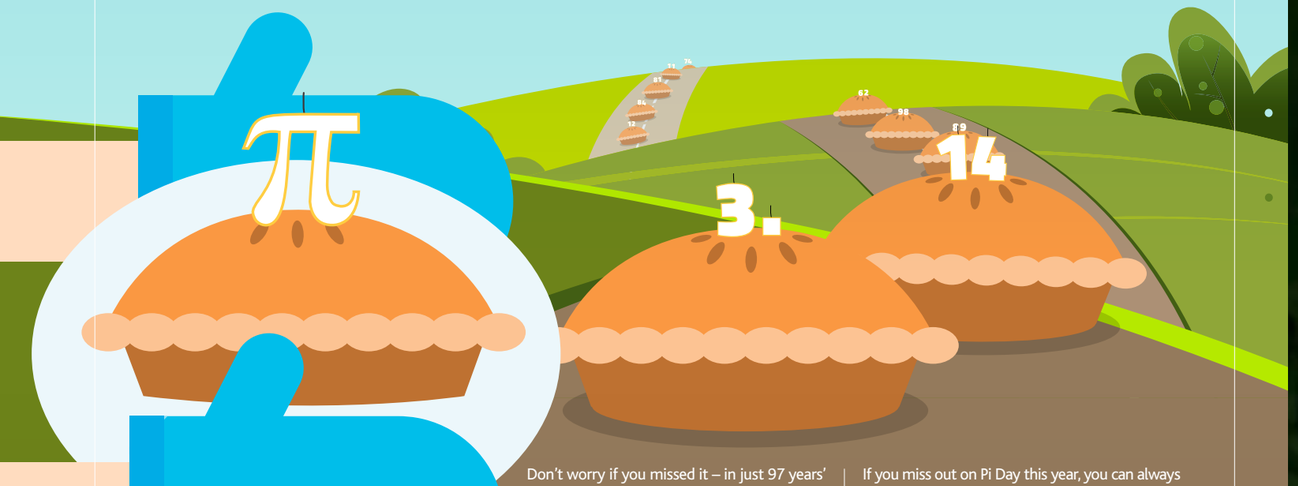
ARTICLES

CPD LISTING



Have your pi and eat it too

by MICHAEL ANDERSON Mathematics Subject Specialist, STEM Learning
@STEMLearning_MA



"Sir, why isn't Pi Day on the 31st of April?"

14 March – 3/14 in the American date format – is known as Pi Day. Three years ago, on 3/14/15 at 9:26:53, whether you were aware of it or not, you were lucky enough to have lived through a Pi Second.

Don't worry if you missed it – in just 97 years' time, a Pi Second will happen again!

Unfortunately, no one reading this experienced the 'Ultimate Pi Day' over 400 years ago, on 14 March 1592. If a maths teacher had a time machine, this would be high on the list of times to visit!

Celebrating Pi Day is actually a much more recent phenomenon. The first recognised event was held in San Francisco in 1988. Thirty years later, how are you and your students going to mark the day?

Pi is one of the first 'magical' numbers students come across at school. The digits of pi go on forever without ever forming a repeating pattern. Although that may sound complicated, pi is actually simple to calculate. Take any circle and divide the length of its circumference by the length of its diameter. Students are amazed when they realise that no matter what size circle they choose, the answer will always be the same irrational number: 3.14... No wonder it has its own special symbol, π.

In school, Pi Day can provide an ideal opportunity to enthuse students about the beauty of mathematics. You may be amazed at how many digits of pi your students can memorise, just as your students will be surprised at the number of areas of mathematics in which pi appears. Students can attempt to calculate pi in a variety of ways, from using a series of polygons to testing the 'Buffon's needle' method by dropping matches, sticks or even baguettes!

If you miss out on Pi Day this year, you can always celebrate all things π four months later, on 22 July (22/7) – known as Pi Approximation Day.

The internet normally has a field day too on Pi Day – with videos demonstrating what a mile worth of the digits of pi look like or featuring mathematicians calculating pi with actual pies!

Have fun this Pi Day.

THE POSSIBILITIES ARE INFINITE

Check out the resources mentioned above, plus more of our favourite pi teaching materials
■ www.stem.org.uk/lxertk

Resourcing the new secondary mathematics curriculum
■ www.stem.org.uk/my202

Using manipulatives to enhance understanding in secondary mathematics
■ www.stem.org.uk/my210

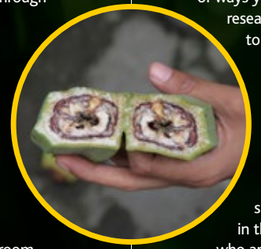
Bananas are big business

by ED WALSH Education Consultant and Regional Development Lead South West
@cornwallscied

Each of us in the UK eats, on average, 100 bananas every year. Bananas are grown in more than 150 countries and the revenue is a lifeline for many of those countries. However, they're susceptible to disease and a fungus such as Panama disease can rip through a harvest.

The new science GCSEs are trying to show students how science can solve international challenges with the aim of inspiring students to select a future in STEM careers. One way teachers can engage students is through the topic of food security – in particular, the banana trade.

How do we save a crop of bananas without having to use toxic fungicides? A better alternative is an approach called intercropping: growing other plants close by that inhibit the growth of the fungus.



You can explore this in your classroom and this topic lends itself nicely to lab work that incorporates a number of techniques and skills in the GCSE specifications. Using baker's yeast and standard lab equipment, students can process possible crops to see which will inhibit the fungus. This will develop their investigative skills and show how current research is exploring sustainable ways of securing food supplies.

It also lends itself to questions that reflect on the full range of GCSE assessment objectives, such as:

- how does inhibiting the growth of the fungus increase food security?
- a scientist concludes that there is none of the disease-causing fungus in the soil in the rainforest biome. Does the evidence support this?
- in the soil from three of the beds there is significant variation between the scores from the pairs of plates prepared. Why is this an issue?

By using current issues and scientific research as a context for your science lessons, you can engage your students to show them the important role of science in our world. There are a number of ways you can get involved with real research and the scientists behind it, to the benefit of your students.

Why not meet the masterminds behind some of today's most cutting-edge science on the innovative programme Bringing Cutting-Edge Research into the Classroom? Or you can spend a day at the Eden Project in the company of plant scientists who are working on crucial aspects of biological research.

ENGAGE YOUR STUDENTS WITH CUTTING-EDGE RESEARCH

FERA (Food and Environment Research Agency) resource collection
■ www.stem.org.uk/cxa49k

Practical plant science and ecology for secondary schools
■ www.stem.org.uk/ny260

Science and plants for schools resource collection
■ www.stem.org.uk/cx4vd

Discover cutting-edge CPD and resources to support your students
■ www.stem.org.uk/ms/RCUK

Food security - going bananas with the Eden Project
■ www.stem.org.uk/rp464

The E in STEM

by GILL COLLINSON Head of Centre and Partnerships, STEM Learning

and GEMMA TAYLOR Design and Technology CPD Lead, STEM Learning
@gtaylorSTEM

2018 is the Year of Engineering, a government campaign to support the engineering profession and encourage the next generation of engineers. To mark this, we've asked our in-house engineers, Gill and Gemma, what the 'E' in STEM means to them.

WHAT DOES ENGINEERING MEAN TO YOU?

As a chartered engineer, Gill says: "Engineering is an exciting profession which requires problem solving, design and creativity skills. It's all about offering the very best solution to a problem. Whatever the issue, engineering finds the simplest solution using the least amount of time, effort and finance. Whether it's an everyday problem, or developing technology of the future, engineering has the answer. It offers practical, workable solutions, often within tight constraints. The skills you develop in engineering are valuable in all other walks of life."

HOW IMPORTANT IS ENGINEERING IN THE CURRICULUM?

Before joining STEM Learning, Gemma was a design and technology teacher with a background in engineering. From her first-hand experience of being on the teaching frontline, Gemma says that "when it comes to teaching STEM subjects, engineering is the context that binds them all together. It shows students where their skills are applied outside of the classroom."

"How do you build a bridge? Material science will tell you which materials can support the load that will be passing over the bridge. Mathematical calculations will work out how much of the material will be needed and in what form it can take. Design will bring the scientific and mathematical knowledge together to create an aesthetic form that visually improves the geographical area it is being built in. These are civil engineers, structural engineers and design engineers all working together.

"Engineering is also an important subject in its own right. There are engineering qualifications students can take, at GCSE and beyond, to develop their future in engineering. We have also heard of engineering lessons with younger children. Some secondary and primary schools are teaching engineering as a subject. They are giving students the opportunity to apply their STEM skills in an engineering context as part of the weekly timetable.

"Engineering UK research shows that we need 182,000 people with engineering skills every year to meet the UK demand for engineering. There is a real need to increase the number of engineers, both through graduate and apprentice routes. This is an exciting opportunity for future engineers who are in school or college right now. It is the current generation of students who we need to fill the engineering skills gap.

"For those students that don't want to become an engineer, developing the core engineering skills will equip them for other roles in the STEM sector. It's win-win!"

Gill agrees: "The context of engineering can enhance and enrich STEM education. It helps young people understand that what they're learning relates to a range of careers in engineering.

"It also provides an excellent opportunity to work with STEM employers in your area. There are thousands of STEM Ambassadors from all walks of engineering you can work with. Lots of research shows that working with employers has a profound impact on students. It increases their knowledge of local businesses and career opportunities, and improves their employability skills.

"Ensuring that engineering is a core part of the curriculum helps us develop a skilled workforce for the future. A workforce who understand the importance in securing a safe and sustainable future."

WHAT DOES THE FUTURE HOLD FOR ENGINEERING?

From a business point of view, Gill suggests that "with the world's population rapidly increasing, the field of engineering must focus on sustainability and environmental protection. Engineering has significantly improved the quality of life for millions of people around the world.

Looking to the future, engineering must continue to find simple solutions to the many problems we face. Our next generation of engineers have an exciting time ahead!"

In terms of engineering in education, Gemma says that she "sees more and more teachers who want to know what engineering is and how their students can get into it. There is a high demand for STEM Ambassadors in engineering which is fantastic. It's brilliant to see so many tweets and posts of students taking part in events like International Women in Engineering Day and Tomorrow's Engineers week."

"CPD programmes like STEM Insight provide teachers with first-hand experience of engineering. There are also loads of resources available for teachers who want to bring engineering into their lessons."

You can't deny that now is an exciting time for the progress of our species. Private companies are expanding the space race, with potential for commercial flights and human missions to Mars. Medical engineering is transforming the ways we repair our bodies, detect disease and maintain life, and the Internet of Things is revolutionising the way we communicate with the world around us.

Perhaps your students could be the next generation of forward-thinking engineers who transform our world for the better.

GILL'S RECOMMENDED READING

Thinking like an engineer: implications for the education system
www.stem.org.uk/rx34af

SEE HOW ENGINEERING CAN BENEFIT YOUR STUDENTS

STEM Insight
www.stem.org.uk/ms/stem-insight

Engineering GCSE: getting to grips with the engineering, mathematics and science subject content
www.stem.org.uk/ty224

Using 3D printers creatively in KS3 and KS4 design and technology
www.stem.org.uk/ty214

The Year of Engineering
www.dft.gov.uk/year-of-engineering-2018

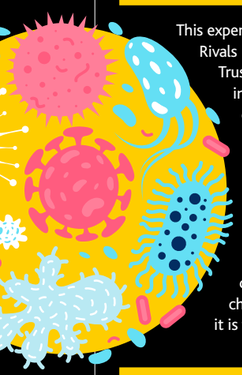
Celebrating International Darwin Day

by SIMON QUINNELL National Technician Lead, STEM Learning
@quinnell75

On 12 February 2018 it's International Darwin Day, marking the scientist's 209th birthday. It's also the 159th anniversary of On the origin of the species, the theory that brought evolution into the mainstream.

To help you celebrate International Darwin Day, we've put together some ideas for activities you could do with your students. From natural selection to exploring the mechanisms behind inheritance, these activities will engage your students and link into the wider field of evolution and genetics.

X BACTERIA



This experiment was part of the Survival Rivals kits developed by the Wellcome Trust for Darwin's 200th birthday in 2009. It's one of the best examples that shows how bacteria can become resistant to antibiotics in a short space of time. Through the process called conjugation, bacteria swap plasmid DNA between different strains. This post-16 practical really highlights how quickly bacteria evolve new characteristics and how difficult it is to combat resistant bacteria.

BATTLE OF THE BEAKS

This activity links directly to Darwin's research on the voyage of the Beagle. During his time on the Galápagos Islands Darwin studied finches. He noted that over time, the finches had developed from a common ancestor into a range of species adapted to survive in the various environments available. One striking adaption the birds had was the range of beak shapes and sizes to deal with different foods. In this activity you can model how the differences in beak shape relate to the availability of food in particular environments.

BRINE DATE

Sexual selection is mentioned in On the origin of species and in more detail in Darwin's The descent of man. Sexual selection is where members of a species choose mates based on specific preferences. In this instance we can observe this behaviour in brine shrimp, which are easy-to-keep crustaceans. This key stage 4 practical is easy to do and the brine shrimp can also be used in other activities.

DNA EXTRACTION

DNA extraction allows students to observe DNA from either cheek cells or kiwi fruits (you can use other fruits as well). It's engaging, simple and cheap, and links to the building block of inheritance DNA. It's a good key stage 3 or even 4 practical to introduce the topic; it's also great for STEM Clubs as well.

TO EXPLORE THESE PRACTICALS, CHECK OUT OUR HANDY RESOURCE LIST

International Darwin Day practicals
■ **www.stem.org.uk/cxev6j**

SUPPORT FOR LESSONS AND BEYOND

Technicians supporting biology: 11-19
■ **www.stem.org.uk/ny604**

New to A level biology
■ **www.stem.org.uk/ny250**

Practical genetics for technicians
■ **www.stem.org.uk/ny632**

Strengthening practical work in biology
■ **www.stem.org.uk/rp200**

Celebrate in your STEM Club
■ **www.stem.org.uk/ms/stem-clubs**

Applying learning in science practicals

by MARK LANGLEY Science CPD Lead, STEM Learning
@mark_sailor

The GCSE science exams take students through a lot of unfamiliar contexts. Students often struggle with moving from the familiar to the unfamiliar and they need support in making this shift.

Core practicals in GCSE science help students understand basic techniques. But students might struggle with applying their skills when confronted with something different in an exam. By taking a more coherent approach to practical science, students will be better prepared for their exams. Covering core practicals lots of times, in different ways and across the sciences, will help students gain confidence. Here are some ideas you can use.

CHEMISTRY

Core practicals include making a salt and carrying out a titration. Once students understand the techniques of each, why not combine the two? Get your students to repeat the titration and then evaporate the solution to get a salt. This is ideal if you're using lower risk reagents like dilute hydrochloric acid and sodium carbonate solution, to make sodium chloride. Then ask your students to calculate the theoretical yield, as well as their actual and percentage yields. They could also test their solutions for the presence of ions to reinforce ion testing.

PHYSICS

Having covered basic energy calculations and specific heat capacity, set students the challenge: what's the power of a tea light candle? This would enable them to show their understanding of key concepts and identify areas for development. It also supports their enquiry skills. You could use optional 'help cards' for equations and key data when students get stuck. This can give you valuable insight into how well students apply their knowledge and understanding.

BIOLOGY

Biology students can use their skills to observe the changes in cell size at a microscopic level (such as onion cells and salt solution). At the same time, ask them to investigate the effect of different solution concentrations on plant matter. Osmosis within potato chunks on a macro scale is a good option.

You can also develop your students' practical skills across the sciences. Use chromatography of plant pigments or amino acids in biology, to give a different context to the skills used in chemistry.

This cross-subject approach will help students when faced with something in an exam that doesn't appear to be what they have been taught. This is particularly important at the higher grades, but all students can benefit from this approach. Develop their practical skills with a focus on the understanding of why they are doing it – they will be less intimidated when they open the exam paper.

PRACTICAL RESOURCES

Exploding cells
■ **www.stem.org.uk/rxepds**

Investigating osmosis
■ **www.stem.org.uk/rx4khj**

DEVELOP YOUR PRACTICAL SKILLS

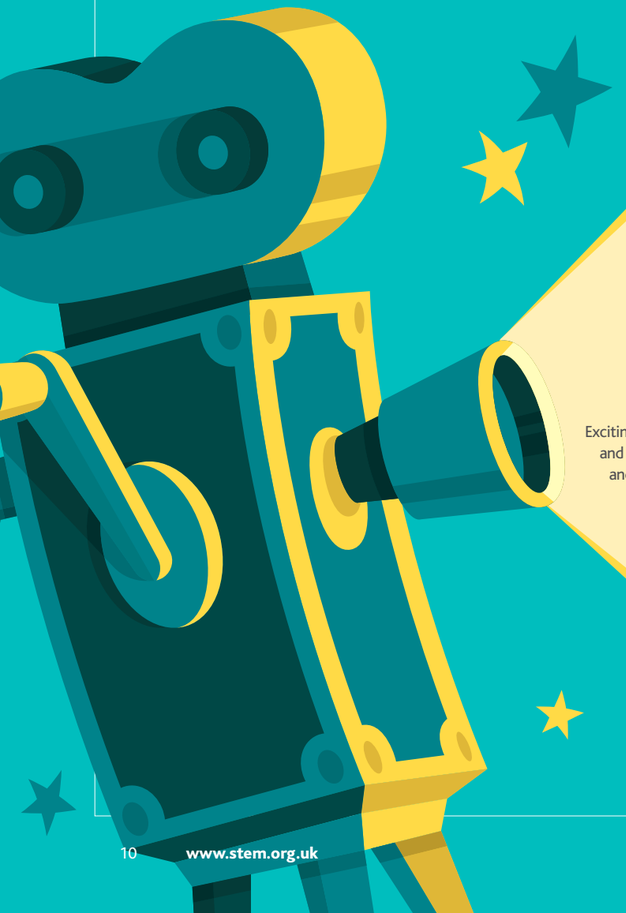
Practical work summer school
■ **www.stem.org.uk/ny217**

Summer school for newly and recently qualified science teachers
■ **www.stem.org.uk/ny255**

Technicians supporting practical work in the classroom
■ **www.stem.org.uk/rp600**

Zombies, wizardry and human augmentation – engaging your students through STEM Clubs

by JO MITCHELL 〉 Project Coordinator - STEM Clubs, STEM Learning



STEM Clubs, whatever the subject base or student age or ability, are one of the best ways to engage students in science, technology, computing, engineering and maths. Clubs allow students the opportunity to explore and try new things, increasing their enthusiasm and interest in STEM subjects and related careers.

Exciting activities, based in an informal setting, promote team working, challenge expectations and boost confidence. By supporting learning, Clubs help improve students' knowledge, skills and abilities in STEM subjects. Students develop their employability skills and are helped to make informed decisions to plan their future career.

STEM Clubs offer you an opportunity to improve your enrichment provision and careers education across your school or college. You can re-energise your enthusiasm for your subject and gain links with local employers and STEM Ambassadors to support your Club activity.

The UK STEM Club Programme, led by STEM Learning, can support you to take the next step. We have developed an inspiring series of themed resources to help you link your STEM Club to topics of real interest to your students.

A STEM FUTURE

Consider a future where we live smarter, where our sporting performance is super-human and our brains are enhanced with implants. Our new resources will enable your students to explore how we can clean our oceans or create more efficient street lighting. Investigate how to develop sport enhancing clothing or how we can improve human nutritional needs.

STEM ON SCREEN

Take a look at how movies are made and the way special effects that are based on practical science create the illusion of witchcraft and wizardry. How does music influence the look and feel of a movie? Together your students discover the real magic of how STEM is an intrinsic ingredient in movie blockbusters.

SURVIVAL STEM

What would your students do in a zombie apocalypse? Or if an asteroid hit Earth? How would they survive being lost on a desert island? Using techniques learned through STEM activities to think outside the box, students can explore some strange scenarios and mysterious activities.

NUMBER 1 FOR STEM CLUBS SUPPORT 〉

All your STEM Club support in one place
- www.stem.org.uk/ms/stem-clubs

Involve a STEM Ambassador in your STEM Club
- www.stem.org.uk/ms/stem-ambassadors

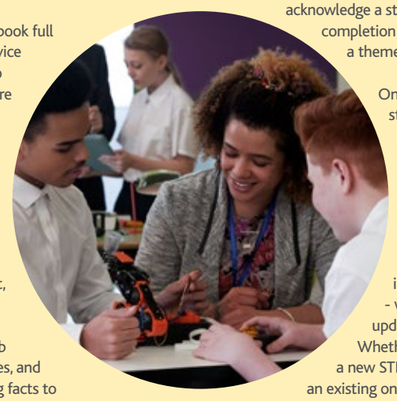
STEM clubs in space
- www.stem.org.uk/ny627

STEM clubs in the wild
- www.stem.org.uk/ny628

Technicians enriching STEM education
- www.stem.org.uk/ny615

We have created three sets of activities for 11 to 14 year olds and one for 14 to 16 year olds in each of these themes.

A comprehensive handbook full of best practice and advice from other Clubs is also available. You can explore video footage of the experiments to help you fully understand the activity you're doing. There are activities for every type of Club, whatever the subject matter, suitable for any student, whatever their ability. Each themed activity has comprehensive Club leader and student notes, and even include fascinating facts to link the experiments to the real world. Impact tools can be accessed to help you measure your students' improvement in knowledge, understanding and even attainment. Certificates of achievement are easily downloadable to acknowledge a student's completion of a theme.



Once your students have solved the problem of zombies or how to create clothing to improve sporting performance, look out for new ideas and suggestions - we're continually updating our resources. Whether you are setting up a new STEM Club or refreshing an existing one, take advantage of these free resources and discover the exciting world of STEM through STEM Clubs.

Immersive experiences to inspire the classroom

by ANTHONY JACKSON Head of Biology and Sixth Form Tutor, Queen Elizabeth's School, Exeter

When I became Head of Biology I was surprised at how few medical students we were producing. I investigated the situation and it appeared that very few of our most able students were applying for medicine in the first place. Looking further it seemed that students were either not well enough informed, or not confident in putting themselves up for medicine. I decided to set up a MedSoc to better support these students towards medicine and related courses. It was through setting this up that I found out about STEM Insight.

STEM Insight is a placement programme that takes teachers out of the classroom and shows them the world of STEM related work taking place in universities and industries. My placement was at the University of Exeter. I spent time with the School of Biomedical Sciences and the Medical School.

My placement was incredible. I had a clear idea about what I wanted to achieve – making links with the medical school to help my students apply successfully. I also wanted to bring back some inspiring stories and teaching ideas. I hadn't realised that the deep immersion of the week-long visit meant I would become inspired to rethink the whole way we deliver A level Biology.

I was able to develop and share ideas with course leaders and students from the University. The experience was all the more powerful because it was reciprocal. The university benefited from finding out about the experiences of our sixth-formers as well as the experiences of us as teachers. It felt as if everyone benefited from the placement.

Since my placement, I've arranged regular inspiring visits and workshops from the university's current medical students. I have also been developing a new way of teaching A level Biology. Exeter Medical School are very effective practitioners of the problem-based learning (PBL) process – something that began development a number of years ago specifically for use in medical schools. PBL offers the opportunity for students to study through full immersion in complex contexts that encourage independent study whilst developing core scientific skills.

I am now developing a scheme of learning that enables PBL to sit at the centre of teaching and learning. The process has not been easy and I simply wouldn't have had any success were it not for the opportunity to experience PBL in action, whilst having the space and time to develop my own approach. Whilst still a work in progress, I am continuing to develop this approach alongside feedback from colleagues and the students themselves.

I would highly recommend the experience of a STEM Insight placement – it is hard work but massively rewarding. I feel much better equipped to support our students in developing careers in the sciences since the STEM Insight opportunity, and I am extremely grateful for the chance to experience something so inspiring.

■ **www.stem.org.uk/ms/stem-insight**

In the spotlight...

NAME: Daniel Williams
AGE: 21
PLACE OF WORK: Airbus Defence and Space, Stevenage

What does your job involve?
We rotate through different departments within the company and gain experience through working on new aspects of the manufacture of satellites. Our jobs can range from writing working instructions to testing parts that make up the satellites.

Can you describe a typical day at work?
Some days start with a team briefing to discuss tasks and any new jobs that come in. Throughout the day, we may be asked if we want to shadow more experienced engineers to see what they're working on or go to the shop floor to work on a part of a satellite. We're always busy!

Why did you decide to do an engineering apprenticeship and what qualifications did you need?
Throughout secondary school I was part of a school karting team. This introduced me to the basics of taking things apart, repairing them and solving any issues. This, and my enjoyment of maths and physics, naturally led me down the engineering route.

My apprenticeship (level 3 Airbus defence and space engineering apprenticeship) required at least five GCSEs at grade A* to C, however, I didn't apply for the apprenticeship until I had completed my A levels. My two options after A levels were a Higher Apprenticeship or a Mechanical Engineering Degree. I chose the apprenticeship over the degree as I valued the work experience much more, and I felt it would set me up for a career in engineering much better than a degree would. Especially as there is potential to study to degree level part-time after I finish my apprenticeship.

What do you find interesting about working in the space sector?
The fact that the jobs we do every day play a part in getting a satellite into space is just incredible. To know that something I am working on will soon be thousands of miles above the Earth's surface is just amazing. Throughout education you learn about space and the Earth's atmosphere, and to be part of a company that builds satellites is something I will always be proud about.

How do you see your career progressing in the future?
After completing my apprenticeship, I hope to secure a job with Airbus and then work my way up to be the best engineer I can be.

What advice would you give to someone considering an apprenticeship?
I think anyone who knows the industry they want to get into should definitely apply for an apprenticeship. Gaining work experience at the same time as gaining qualifications is invaluable. Having work experience is so important for finding a job these days, that I think an apprenticeship is probably one of the best routes into a job at the moment.

> "The fact that the jobs we do every day play a part in getting a satellite into space is just incredible. To know that something I am working on will soon be thousands of miles above the Earth's surface is just amazing."

EXPLORE STEM CAREERS

STEM careers toolkit
■ **www.stem.org.uk/ms/careers-toolkit**

STEM Ambassadors
■ **www.stem.org.uk/ms/stem-ambassadors**

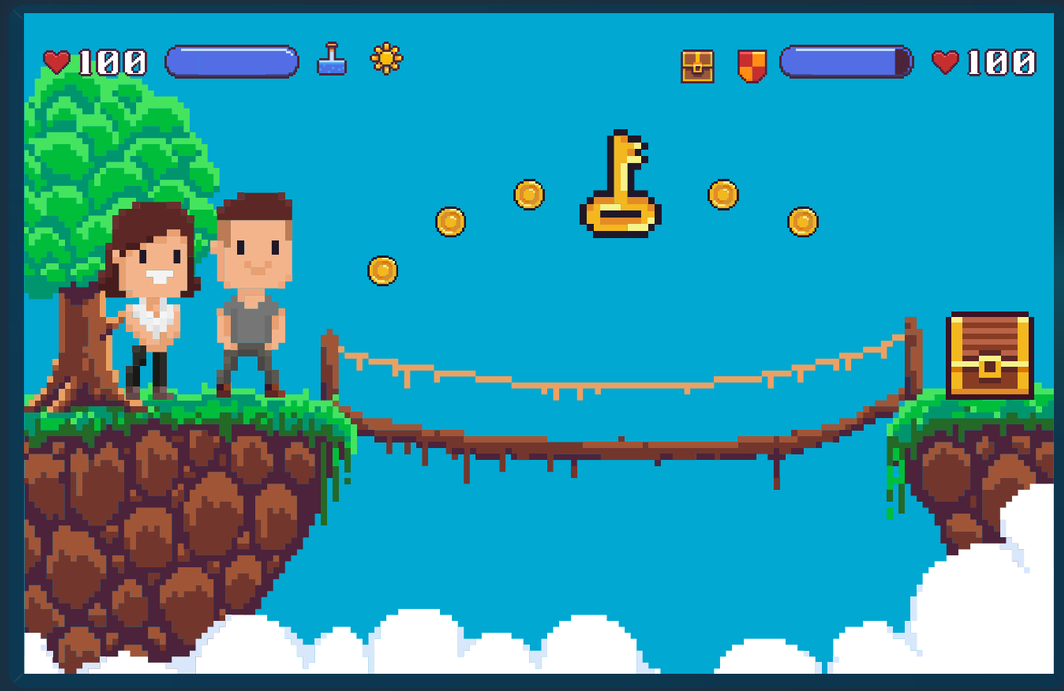
STEM Insight
■ **www.stem.org.uk/ms/stem-insight**

STEM Clubs in space
■ **www.stem.org.uk/ny627**

Careers in STEM
■ **www.stem.org.uk/rp226**

Making revision pack a punch

by DAVID BAILEY
@Class_Leading
Director of Research and Development, Carmel College, Darlington



This is the time of year when many students are busy thinking about how best to draw together years of learning in preparation for their exams.

As time for revision is always tight, it makes sense to encourage students to use techniques which will have a definite impact. Learners often think strategies such as re-reading a text or highlighting key words are worthwhile techniques – however, the evidence from work by Dunlosky and others suggests that this will have little effect. So, how do students make the best use of revision, and how can you help them structure it to get the best results?

HELP STUDENTS TO UNDERSTAND THE 'LANGUAGE OF EXAMS'

Examination boards typically provide details of the meaning of the command words in their specifications. It is important that teachers translate these for students so that they are clear about the difference between words such as 'describe' and 'explain'. Consistent use of this language throughout your teaching will help students.

Taking the time to walk through examples of questions will also help clarify the difference, especially if the students are involved in deciding what to write about.

TEACH STUDENTS THE BEST REVISION SKILLS

Make sure that you start this as early as possible – but it is never too late to begin. Many successful schools make teaching revision skills part of the curriculum for younger students. This helps them develop the skills over time, rather than relying on them working it out for themselves.

A few of the top techniques to cover include:

- how to test themselves
- using flashcards for recall
- teaching others
- use of metacognitive approaches (eg elaborative interrogation and self-explanation)

ENCOURAGE THE USE OF ACTIVE LEARNING

Make the most of every moment in the classroom. Some teachers swear by flipped learning approaches – where you set passive texts, such as reading around a topic, as homework – and focus on discussion and active learning in the classroom.

Get students thinking by using quizzes to test their understanding. Apps such as Socrative make the setting and testing of quizzes and questions very simple, however, simple pen and paper quizzes or questions from revision guides would do. Remember to include deeper questions and those in novel contexts too.

GET THEM MARKING

It is so important for students to understand the assessment criteria. One way that this can be achieved is to gradually hand over the responsibility of assessment to students.

The goal is to help students to develop a similar level of understanding in examination assessment that a teacher might have. Encourage them to use mark schemes to assess themselves and their peers to help them understand how marks are assessed in tests.

REVISIT TOPICS AND TEACH THEM THROUGH DIFFERENT CONTEXTS

Assume that learners will forget much of what they are taught and build this in to the way that you teach. Revisiting the same idea over time will help embed the underlying concept.

There is now an increased emphasis on the application of students' knowledge. By teaching topics in different contexts, your students will be more confident in applying what they have learned. Take a look at our article on Applying learning in science practicals on page 11 for more information.

SUPPORT TO MAKE YOUR REVISION HIT THE TARGET

Effective preparation for examinations
www.stem.org.uk/rp211

Improving students' learning with effective learning techniques, John Dunlosky et al
http://journals.sagepub.com/stoken/rbtfl/Z10jaVH/60XQM/full

Our top picks for your calendar...

EDITOR'S TOP PICK

STEM CLUBS WEEK
5-10 FEBRUARY

STEM Clubs are a great way to engage students with STEM subjects and develop their practical, teamwork and leadership skills. 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/ms/stem-clubs

NATIONAL CAREERS WEEK AND NATIONAL APPRENTICESHIP WEEK
5-9 MARCH

Careers guidance is a crucial part of a young person's education. Use these weeks to raise awareness of STEM careers and pathways. If you're looking for inspiration, our STEM careers toolkit provides a handy guide to get you started.

■ www.stem.org.uk/ms/careers-toolkit

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. There are tons of ways you and your students can get involved, from the British Science Association's poster competition to hosting your own events.

■ www.britishscienceweek.org

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/recognition

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

Lorraine Underwood @LMcUnderwood — Follow

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

Miss Bennett @MissBennett1 — Follow

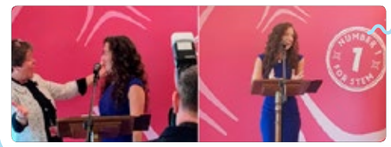
Excited to be part of the polar explore programme with @STEMLearningUK and @Techniquest @pontlottyn

Howard Junior School @HowardJuniorSch — Follow

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

Dr Emily Grossman @DrEmilyGrossman — Following

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 students 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 students:

- 75% of teachers see improvements in student engagement in STEM subjects
- 45% see students 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**

100% DISCOUNT AVAILABLE

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

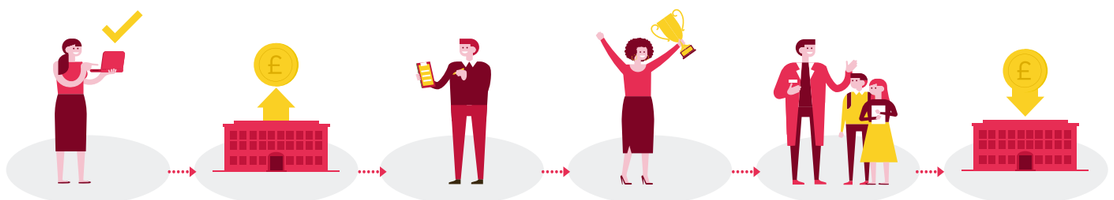
- find the CPD with a yellow circle in the listing
- when booking online use the code **SECSUMMER18**
- pay the VAT (which as a state-funded school or college you may be able to claim back)

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

All fees and award values are valid for state funded schools and colleges are correct at the time of print (November 2017). See 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 or technicians working in state-funded schools or colleges 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.



1. BOOK
Book your CPD

2. PAY
Your school or college pays the activity fee

3. PLAN
Complete intended learning outcomes and your action plan

4. ATTEND
Attend your CPD and complete your evaluation

5. REFLECT
Embed new ideas in the classroom and see increased impact

6. REIMBURSED
Your state-funded school or college is reimbursed with the ENTHUSE bursary

COMPUTING

INTENSIVE SUBJECT-SPECIFIC CPD
Accommodation and meals included

ALGORITHMS IN A LEVEL COMPUTER SCIENCE

Develop your understanding of the abstraction of problems and examine procedural, functional and data abstraction. Analyse the effectiveness and complexity of different algorithms and will take away teaching ideas for use in the classroom.
- Your school receives: £300 ENTHUSE bursary
- Activity fee: £250 (excl VAT)
- 9 May 2018 (1 day)

www.stem.org.uk/cy206

ALGORITHMS IN GCSE COMPUTER SCIENCE

Examine how algorithms are modelled, constructed and represented. Take away engaging ideas to help students understand how to read and create algorithms to solve problems, recognising patterns and designing for efficiency.
- Your school receives: £300 ENTHUSE bursary
- Activity fee: £250 (excl VAT)
- 8 May 2018 (1 day)

www.stem.org.uk/cy205

DATA STRUCTURES AND DATA REPRESENTATION FOR GCSE COMPUTER SCIENCE

Explore database models, management systems and queries. Discover classroom activities and teaching techniques to improve teaching of this subject area.
- Your school receives: £300 ENTHUSE bursary
- Activity fee: £300 (excl VAT)
- 23 May 2018 (1 day)

www.stem.org.uk/cy203

EVIDENCING PROGRESS IN COMPUTING AT KEY STAGE 3

Investigate the different approaches to assessment and monitoring and learn how to design an assessment and monitoring system personalised to the needs of your department.
- Your school receives: £300 ENTHUSE bursary
- Activity fee: £300 (excl VAT)
- 6 June 2018 (1 day)

www.stem.org.uk/cy251

INTRODUCTION TO FUNCTIONAL PROGRAMMING

Functional programming requires a different way of thinking and can be challenging to students and their teachers. A CAS master teacher will help you teach students to write functional code that other programmers can understand, and that computers can perform.
- Your school receives: £700
- Activity fee: £500 (excl VAT)
- 4 June 2018 (2 days)

www.stem.org.uk/cy240

"It has given me more confidence in my teaching of the topic and many alternative ways to teach the topics."

- Daniel Padgham
Subject Leader ICT and Computing, Canon Lee School

NEW TO TEACHING GCSE COMPUTER SCIENCE

Explore the themes common to all exam boards such as algorithms, programming, computer systems, networking and data. Develop your leadership of practical assessed tasks, make effective use of out-of-school learning and discover a range of tools that can be used in teaching.
- Your school receives: £600
- Activity fee: £600 (excl VAT)
- 11 June 2018 (2 days)

www.stem.org.uk/cy201

TEACHING DATA AND DATA STRUCTURES FOR A LEVEL COMPUTER SCIENCE

Develop your ability to teach GCSE computer science by developing student competency using a range of data structures and types.
- Your school receives: £500 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 24 May 2018 (2 days)

www.stem.org.uk/cy204

CROSS-CURRICULAR

INTENSIVE SUBJECT-SPECIFIC CPD
Accommodation and meals included

STEM CLUBS IN SPACE

Use the context of space, biology in space and cutting edge science to engage your STEM Club students.
- Your school receives: £700 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 9 April 2018 (2 days)

www.stem.org.uk/ny627

STEM CLUBS IN THE WILD

Use the wider world to put STEM subjects into context for projects which excite your students. STEM Clubs get students thinking about the world around them and help them develop life skills.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £500 (excl VAT)
- 11 April 2018 (2 days)

www.stem.org.uk/ny628

TAKING PART IN STEM LEARNING SCIENCE CPD IMPROVES TEACHER RETENTION BY160%

FOR MORE DATES AND VENUES VISIT WWW.STEM.ORG.UK/CPD • CPD LISTING

DESIGN & TECHNOLOGY

INTENSIVE SUBJECT-SPECIFIC CPD
Accommodation and meals included

100% DISCOUNT AVAILABLE

CONTROLLING MOTORS AND PROTOTYPING ELECTRONIC CIRCUITS WITH MICRO:BIT

Discover how the micro:bit can be used to create programmable electronics projects. Take away a free Kitronik Motor Board, Kitronik Prototyping System and lots of project ideas.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 9 July 2018 (2 days)

■ **www.stem.org.uk/ty238**

DEVELOPING DESIGN AND TECHNOLOGY TEACHING FOR NEWLY QUALIFIED TEACHERS

Support for new to teaching and newly qualified design and technology teachers.
- Your school receives: £1,050 ENTHUSE bursary
- Activity fee: £900 (excl VAT)
- 9 July 2018 (3 days)

■ **www.stem.org.uk/ty246**

DEVELOPING MATHEMATICS SKILLS FOR THE NEW DESIGN AND TECHNOLOGY GCSE

Improve your subject knowledge and develop strategies for teaching the mathematics content in the new design and technology GCSE.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £500 (excl VAT)
- 21 May 2018 (2 days)

■ **www.stem.org.uk/ty225**

100% DISCOUNT AVAILABLE

DEVELOPING SKILLS FOR THE F1 IN SCHOOLS STEM CHALLENGE

Explore how to design, analyse, manufacture, test and race, miniature gas powered F1 model block cars. Discover Autodesk Fusion 360, CAD modelling and CNC manufacture.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 29 June 2018 (2 days)

■ **www.stem.org.uk/ty200**

ENGINEERING GCSE: GETTING TO GRIPS WITH THE ENGINEERING, MATHEMATICS AND SCIENCE SUBJECT CONTENT

Improve your engineering, mathematics and science subject knowledge and develop teaching strategies for teaching the engineering GCSE.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 25 June 2018 (2 days)

■ **www.stem.org.uk/ty224**

GETTING IT RIGHT IN KEY STAGE 3, LAYING GOOD FOUNDATIONS FOR DESIGN AND TECHNOLOGY GCSE

Discover how to develop your key stage 3 curriculum, supporting progression into design and technology GCSE.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 15 June 2018 (2 days)

■ **www.stem.org.uk/ty241**

GETTING TO GRIPS WITH USING THE CRUMBLE CONTROLLER IN KEY STAGE 3 DESIGN AND TECHNOLOGY

Learn how the Crumble Controller can be used in design and technology to create electronic products at key stage 3.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 13 June 2018 (2 days)

■ **www.stem.org.uk/ty237**

TEACHING ELECTRONICS, INCLUDING E-TEXTILES, IN DESIGN AND TECHNOLOGY GCSE

Taking you from being an absolute beginner in electronics, including E-textiles, to having the confidence to tackle basic programming in the classroom.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 18 June 2018 (2 days)

■ **www.stem.org.uk/ty240**

USING 3D PRINTERS CREATIVELY IN KS3 AND KS4 DESIGN AND TECHNOLOGY

Find out how to make better use of your 3D printer in the classroom and fix those troublesome printing issues!
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 3 July 2018 (2 days)

■ **www.stem.org.uk/ty214**

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 bursary
- Activity fee: £650 (excl VAT)
- 22 June 2018 (2 days)

■ **www.stem.org.uk/ty706**

MATHEMATICS

INTENSIVE SUBJECT-SPECIFIC CPD
Accommodation and meals included

AN INTRODUCTION TO CORE MATHS

Gain a clear understanding of the role core maths plays in schools and colleges. Experience a range of teaching approaches, consider sources of resources and how they may be used and develop a strategy for assessing and tracking student progress.
- Your school receives: £1,050 ENTHUSE bursary
- Activity fee: £750 (excl VAT)
- 13 June 2018 (3 days)

■ **www.stem.org.uk/my507**

100% DISCOUNT AVAILABLE

NEW TO TEACHING A LEVEL MATHEMATICS SUMMER SCHOOL

Learn to teach maths for understanding and engagement rather than "teaching to the test". Increase your subject knowledge and deepen your understanding of mathematics.
- Your school receives: £1,200 ENTHUSE bursary
- Activity fee: £1,200 (excl VAT)
- 20 August 2018 (4 days)

■ **www.stem.org.uk/my500**

RESOURCING THE NEW SECONDARY MATHEMATICS CURRICULUM

Explore resources designed to support improved teaching of the new curriculum with hand-on activities.
- Activity fee: £80 (excl VAT)
- 20 April 2018 (1 day)

■ **www.stem.org.uk/my202**

> "All the sessions were useful in different ways. My confidence in using 3D printers has developed hugely and I am now armed with the necessary skills and confidence to fully integrate 3D printing in to the curriculum."
>
> **- Lisa Diccox**
> Subject leader, Ermysted's Grammar School

SUMMER SCHOOL: BUILDING CONFIDENCE AS A NEWLY QUALIFIED MATHEMATICS TEACHER

Immerse yourself in this residential summer school for new maths teachers to help develop your practice.
- Your school receives: £1,500 ENTHUSE bursary
- Activity fee: £1,500 (excl VAT)
- 9 July 2018 (5 days)

■ **www.stem.org.uk/my506**

TEACHING FOR DEEP UNDERSTANDING IN A LEVEL MATHEMATICS

Explore subject pedagogical knowledge to develop your confidence to teach for understanding and engagement. Work with other teachers to develop and present effective approaches to the introduction of key ideas in A level mathematics.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 16 July 2018 (3 days)

■ **www.stem.org.uk/my501**

> "I have found the course very useful for developing my thinking and how I can support students to make links between topics. All the sessions have been very useful."
>
> **- Gina Edmunds**
> Subject leader, Calder High School

TEACHING GCSE MATHEMATICS POST-16 IN A YEAR

Learn how to inspire young people who are required to resit their mathematics GCSE. Explore the requirements of the new curriculum and discover different ways of teaching resit students
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 2 July 2018 (2 days)

■ **www.stem.org.uk/my504**

100% DISCOUNT AVAILABLE

USING MANIPULATIVES TO ENHANCE UNDERSTANDING IN SECONDARY MATHEMATICS

Manipulatives include counters, interlocking cubes, Cuisenaire rods and tiles. Learn how to use them to encourage active learning in mathematics.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 18 June 2018 (2 days)

■ **www.stem.org.uk/my210**

SCIENCE

INTENSIVE SUBJECT-SPECIFIC CPD
Accommodation and meals included

100% DISCOUNT AVAILABLE

LAB DESIGN: PLANNING SCIENCE SPACES

Well-planned, imaginative and practical science spaces in schools and colleges can create outstanding learning environments for both students and teachers.
- Your school receives: £600 ENTHUSE bursary
- Activity fee: £600 (excl VAT)
- 9 April 2018 (1 day)

■ **www.stem.org.uk/ny211**

CPD NEAR YOU
Browse dates and venues online

BEHAVIOUR MANAGEMENT IN SCIENCE

Supporting teachers new to the profession in considering ways of managing the behaviour of their students so that a positive, effective learning environment can be sustained.
- Browse dates and venues online

■ **www.stem.org.uk/rp222**

CAREERS IN STEM

Develop your understanding and support students in signposting career options.
- Browse dates and venues online

■ **www.stem.org.uk/rp226**

DELIVERING THE LATEST SCIENCE CURRICULUM

Identify the key issues arising from the new curriculum and consider how to audit and adapt existing schemes of learning to accommodate the changes.
- Browse dates and venues online

■ **www.stem.org.uk/rp223**

EFFECTIVE PREPARATION FOR EXAMINATIONS

Helping teachers in developing effective strategies for supporting students as they prepare for exams.
- Browse dates and venues online

■ **www.stem.org.uk/rp211**

ENGAGING AND ENSURING PROGRESS OF LOW ATTAINERS IN SCIENCE

Develop strategies to improve the progress made by low attaining students in science.
- Browse dates and venues online

■ **www.stem.org.uk/rp229**

ENHANCING LITERACY SKILLS IN SCIENCE

Supporting participants in responding to the increased literacy demands in examinations and help to provide students with the skills to be effective, independent learners.
- Browse dates and venues online

■ **www.stem.org.uk/rp212**

IMPROVING PROGRESS IN SCIENCE

Learn a variety of strategies to track and improve students' progress and improve outcomes.
- Browse dates and venues online

■ **www.stem.org.uk/rp213**

IMPROVING SUBJECT AND CURRICULUM KNOWLEDGE IN...

It is important to keep up-to-date with current science matters, including pure subject knowledge, topic specific developments and general pedagogical methods.
- Browse dates and venues online

■ **www.stem.org.uk/rp224**

INTRODUCING THE NEW SCIENCE GCSES

Become familiar with the next generation of GCSE science courses.
- Browse dates and venues online

■ **www.stem.org.uk/rp230**

KEY STAGE 3 SCIENCE FOR NON-SCIENCE SPECIALISTS

Teach pre-GCSE level science confidently.
- Browse dates and venues online

■ **www.stem.org.uk/rp297**

MAKING A DIFFERENCE THROUGH EFFECTIVE FEEDBACK

Trial a range of strategies for gathering and using data, explore the research behind assessment for learning, and develop and test your own techniques in the classroom.
- Browse dates and venues online

■ **www.stem.org.uk/rp203**

MATHEMATICS IN SCIENCE TEACHING

Explore the use and failure to use mathematics in science. It looks at typical weaknesses in mathematics that hinder students' ability to understand and solve scientific problems.
- Browse dates and venues online

■ **www.stem.org.uk/rp210**

SCIENCE (CONTINUED...)

RESPONDING TO PUPIL NEEDS IN SCIENCE

Develop strategies which personalise the science curriculum, in order to engage students of all abilities, widen engagement and participation, and increase progression to further science study.
- Browse dates and venues online
- **www.stem.org.uk/rp220**

SCIENCE FOR LOWER ATTAINING STUDENTS: SUPPORTING THE 1-3 AGENDA

Explore ways to support your students who are likely to attain grades 1 to 3 at GCSE science.
- Browse dates and venues online
- **www.stem.org.uk/rp296**

TEACHING ASSISTANTS SUPPORTING LEARNING

Explore strategies to improve your impact on students.
- Browse dates and venues online
- **www.stem.org.uk/rp228**

TOWARDS OUTSTANDING

Secure knowledge of what outstanding practice looks like strengthens the ability to support colleagues, for the benefit of themselves and their students.
- Browse dates and venues online
- **www.stem.org.uk/rp215**

LEADERSHIP

CPD NEAR YOU
Browse dates and venues online

ESSENTIAL SKILLS FOR NEW AND ASPIRING SCIENCE LEADERSHIP

Working with an experienced science leader, you will develop your vision and leadership skills to enable you to lead an effective and vibrant science team.
- Browse dates and venues online
- **www.stem.org.uk/rp206**

LEADING ACTION RESEARCH IN SCIENCE EDUCATION

Gaining further classroom enquiry skills will provide an opportunity for you to review and reflect on personal and professional practice to the benefit of your students.
- Browse dates and venues online
- **www.stem.org.uk/rp209**

SUBJECT LEADERS NETWORK

This is a chance for collaboration with your peers so you can share information and develop as a leader. Expert consultants will help you identify priority issues in teaching and learning and professional development for your teams.
- Browse dates and venues online
- **www.stem.org.uk/rp219**

97%

of participants expect the CPD to further impact their future practice

BIOLOGY

INTENSIVE SUBJECT-SPECIFIC CPD
Accommodation and meals included

NEW TO A LEVEL BIOLOGY

Through the development of new practical techniques, use of ICT activities and context based learning strategies, this CPD will provide a foundation for those with little experience of teaching A level biology.
- Your school receives: £1,200 ENTHUSE bursary
- Activity fee: £1,000 (excl VAT)
- 28 June 2018 (4 days)
- **www.stem.org.uk/ny250**

PRACTICAL PLANT SCIENCE AND ECOLOGY FOR SECONDARY SCHOOLS

Develop your knowledge in field study techniques, including a visit to RHS Garden Harlow Carr. Explore horticulture practicals and learn new ways to use plants in science lessons.
- Your school receives: £1,050 ENTHUSE bursary
- Activity fee: £900 (excl VAT)
- 11 July 2018 (3 days)
- **www.stem.org.uk/ny260**

"The course will allow me to deepen my knowledge of botany and ecology, make it more interesting to organise biology lessons, as well as share knowledge with teachers."

- Norbert Kleszko
The Elmgreen School

CPD NEAR YOU
Browse dates and venues online

ACTIVE APPROACHES IN A LEVEL BIOLOGY

Providing opportunities to explore the acknowledged benefits of active, collaborative and 'minds-on' approaches to learning at advanced level.
- Browse dates and venues online
- **www.stem.org.uk/rp506**

GETTING TO GRIPS WITH A LEVEL BIOLOGY

Supporting teachers in developing higher level thinking with their students through the use of practical work, demonstrations and modelling activities.
- Browse dates and venues online
- **www.stem.org.uk/rp501**

GOING FURTHER IN A LEVEL BIOLOGY

Discussing the wider implications and applications of biology and exploring some tools for teaching and learning, will broaden and deepen your repertoire of practical activities and teaching approaches.
- Browse dates and venues online
- **www.stem.org.uk/rp509**

PREPARING FOR PRACTICAL TEACHING AND ASSESSMENT IN A LEVEL BIOLOGY

Prepares teachers to make effective use of practical work in the new A level science curriculum.
- Browse dates and venues online
- **www.stem.org.uk/rp510**

STRENGTHENING PRACTICAL WORK IN BIOLOGY

Explore strategies for teaching topics across the biology curriculum and develop an understanding of how practical work can be made more relevant and effective.
- Browse dates and venues online
- **www.stem.org.uk/rp200**

CHEMISTRY

INTENSIVE SUBJECT-SPECIFIC CPD
Accommodation and meals included

NEW TO TEACHING A LEVEL CHEMISTRY

With much of chemistry centred around good experimental skills, this activity allows you to develop, lead and support outstanding practical chemistry, linking it to effective pedagogy within the subject.
- Your school receives: £1,200 ENTHUSE bursary
- Activity fee: £1,200 (excl VAT)
- 26 April 2018 (4 days)
- **www.stem.org.uk/ny251**

CPD NEAR YOU
Browse dates and venues online

ACTIVE APPROACHES IN A LEVEL CHEMISTRY

Providing opportunities to explore the acknowledged benefits of active, collaborative and 'minds-on' approaches to learning at advanced level.
- Browse dates and venues online
- **www.stem.org.uk/rp504**

GETTING TO GRIPS WITH A LEVEL CHEMISTRY

Improve confidence in subject knowledge and skills appropriate to post-16 chemistry through the exploration of key ideas common to all specifications.
- Browse dates and venues online
- **www.stem.org.uk/rp502**

GOING FURTHER IN A LEVEL CHEMISTRY

Confident teachers will deepen their repertoire of practical activities and teaching approaches with a key focus in the use of electronic technologies.
- Browse dates and venues online
- **www.stem.org.uk/rp508**

MEETING THE DEMANDS OF CHEMISTRY IN THE NEW A LEVEL SPECIFICATIONS

Explore how specific activities can be used to get across key concepts; use maths skills and develop practical skills in chemistry.
- Browse dates and venues online
- **www.stem.org.uk/rp514**

MEETING THE DEMANDS OF CHEMISTRY IN THE NEW GSCE SPECIFICATIONS

This one day course will show how specific activities can be used to get across key concepts: use maths skills and develop practical skills in chemistry.
- Browse dates and venues online
- **www.stem.org.uk/rp232**

PREPARING FOR PRACTICAL TEACHING AND ASSESSMENT IN A LEVEL CHEMISTRY

Designed to prepare teachers to make effective use of practical work in A level chemistry and use them to improve outcomes for students.
- browse dates and venues online
- **www.stem.org.uk/rp512**

STRENGTHENING PRACTICAL WORK IN CHEMISTRY

Through hands-on activities you will undertake new and established strategies and practical techniques to make students' learning more effective.
- Browse dates and venues online
- **www.stem.org.uk/rp202**

PHYSICS

INTENSIVE SUBJECT-SPECIFIC CPD
Accommodation and meals included

NEW TO A LEVEL PHYSICS

Develop your teaching schemes and discover how to incorporate exciting practicals into your A level physics lessons.
- Your school receives: £1,200 ENTHUSE bursary
- Activity fee: £1,000 (excl VAT)
- 7 June 2018 (4 days)

■ **www.stem.org.uk/ny252**

"The session on waves was most useful for me. With the plethora of practical demonstrations set up and the freedom to use them, I could easily see how I could use some of the ideas in my own teaching practice. Also, the delivery of the session using chocolate and sweets made me think more about the use of science specific vocabulary when speaking with students."

- Maxim Thornton
Rastrick High School

100% DISCOUNT AVAILABLE

STIMULATING PHYSICS NETWORK SUMMER SCHOOL: YEAR 1

Run by the Stimulating Physics Network, boost your physics lessons by improving your understanding of the subject through engaging practical work and inspiring experiences.
- Your school receives: £1,200 ENTHUSE bursary
- Activity fee: £1,000 (excl VAT)
- 13 August 2018 (4 days)

■ **www.stem.org.uk/ny221**

100% DISCOUNT AVAILABLE

STIMULATING PHYSICS NETWORK SUMMER SCHOOL: YEAR 2

Attend workshops to develop your teaching of gravity, light, waves, dynamics, momentum, radioactivity, electromagnetism and energy.
- Your school receives: £1,200 ENTHUSE bursary
- Activity fee: £1,000 (excl VAT)
- 13 August 2018 (4 days)

■ **www.stem.org.uk/ny222**

CPD NEAR YOU
Browse dates and venues online

ACTIVE APPROACHES IN A LEVEL PHYSICS

Working with others, you will refresh your teaching and learning strategies to improve you students' understanding of core concepts of A level physics.
- Browse dates and venues online

■ **www.stem.org.uk/rp505**

GETTING TO GRIPS WITH A LEVEL PHYSICS

Develop subject knowledge, confidence and skills primarily through the exploration of key demonstrations and practicals common to all specifications.
- Browse dates and venues online

■ **www.stem.org.uk/rp503**

GOING FURTHER IN A LEVEL PHYSICS

Ideal for teachers who are confident in their subject knowledge as there will be ample opportunity to try out these new approaches.
- Browse dates and venues online

■ **www.stem.org.uk/rp507**

PHYSICS FOR NON-SPECIALISTS

Develop your understanding of key physics principles and the skills and strategies needed to teach physics effectively.
- Browse dates and venues online

■ **www.stem.org.uk/rp208**

PREPARING FOR PRACTICAL TEACHING AND ASSESSMENT IN A LEVEL PHYSICS

Together we look at how activities can be run effectively, used to support the awarding of the practical endorsement and to improve exam grades.
- Browse dates and venues online

■ **www.stem.org.uk/rp511**

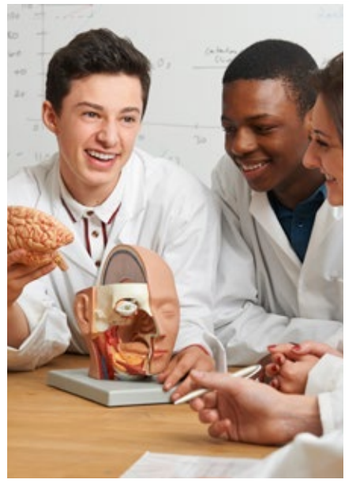
STRENGTHENING PRACTICAL WORK IN PHYSICS

Explore a range of ideas for teaching topics across the physics curriculum and develop an understanding of how practical work can be made more relevant and effective.
- Browse dates and venues online

■ **www.stem.org.uk/rp201**

TRIPLE SCIENCE

CPD NEAR YOU
Browse dates and venues online



IDENTIFYING AND INSPIRING YOUR STUDENTS IN TRIPLE SCIENCE

Using data from KS3 can help you identify students who are suitable for triple science. Examine ways to motivate students, enrich their triple science learning and investigate STEM careers resources.
- Browse dates and venues online

■ **www.stem.org.uk/rp781**

MANAGING EFFECTIVE PRACTICAL WORK IN TRIPLE SCIENCE

Teachers who are new to teaching triple science will explore ways to develop their use of practical work.
- Browse dates and venues online

■ **www.stem.org.uk/rp782**

RAISING ATTAINMENT IN TRIPLE SCIENCE

Looking to improve students' performance? This course will enable you to consider a range of key strategies to help you achieve this. It has been designed for science departments that have little or no experience in delivering triple science.
- Browse dates and venues online

■ **www.stem.org.uk/rp777**

TRIPLE SCIENCE: BIOLOGY

Teachers who have experience of teaching biology at 14 to 16 will gain support in effective teaching and learning of the triple science extension modules. Explore a range of modules from across the awarding bodies.
- Browse dates and venues online

■ **www.stem.org.uk/rp780**

TRIPLE SCIENCE: CHEMISTRY

Teachers who have experience of teaching chemistry at 14 to 16 will gain support in effective teaching and learning of the triple science extension modules. Explore a range of modules from across the awarding bodies.
- Browse dates and venues online

■ **www.stem.org.uk/rp779**

TRIPLE SCIENCE NETWORK OF EXCELLENCE

This network will consider what effective teaching and learning of the triple science extension modules could look like.
- Browse dates and venues online

■ **www.stem.org.uk/rp793**

TRIPLE SCIENCE: PHYSICS

Teachers who have experience of teaching physics at 14 to 16 will gain support in effective teaching and learning of the triple science extension modules. Explore a range of modules from across the awarding bodies.
- Browse dates and venues online

■ **www.stem.org.uk/rp778**

TRIPLE SCIENCE: PREPARING FOR LINEAR ASSESSMENT

Go beyond looking at short term interventions to explore issues such as progression, tracking progress and how best to structure learning so students gain a deep, long terms understanding of the science.
- Browse dates and venues online

■ **www.stem.org.uk/rp788**

NEWLY QUALIFIED TEACHERS

INTENSIVE SUBJECT-SPECIFIC CPD
Accommodation and meals included

PRACTICAL WORK SUMMER SCHOOL

For newly qualified teachers or those moving into science, learn how to plan, deliver and evaluate effective science lessons
- Your school receives: £1,750 ENTHUSE bursary
- Activity fee: £1,500 (excl VAT)
- 16 July 2018 (5 days)

■ **www.stem.org.uk/ny217**

SUMMER SCHOOL FOR NEWLY AND RECENTLY QUALIFIED SCIENCE TEACHERS

Hone your skills in delivering challenging and inspirational practical activities and develop your teaching skills further to inspire and engage your students.
- Your school receives: £1,500 ENTHUSE bursary
- Activity fee: £1,200 (excl VAT)
- 9 July 2018 (5 days)

■ **www.stem.org.uk/ny255**

"I have found the course really informative and it has made me think about and reflect on what I do in the classroom and why. It was also great to hear the examples of teaching from other teachers at different points of their career and gain from their experiences."

- Rebecca Brewis
King Alfred's

FOR MORE DATES AND VENUES VISIT WWW.STEM.ORG.UK/CPD • CPD LISTING

“I NOW KNOW THAT UNTIL YOU STEP THROUGH THE DOORS OF A COMPANY, YOU CAN'T REALLY UNDERSTAND WHAT YOU ARE ACTUALLY PREPARING YOUNG PEOPLE FOR.”

MARIE JOBSON

Careers Education, Information, Advice and Guidance Lead

www.stem.org.uk/ms/stem-insight

TECHNICIANS

INTENSIVE SUBJECT-SPECIFIC CPD

Accommodation and meals included

ADVANCED TECHNICIAN SKILLS

Perfect for technicians who want to refresh and develop their skills further to provide and effective technical service.

- Your school receives: £900 ENTHUSE bursary
- Activity fee: £750 (excl VAT)
- 14 May 2018 (3 days)

■ **www.stem.org.uk/ny631**

100% DISCOUNT AVAILABLE

DESIGN AND TECHNOLOGY TECHNICIANS: LEADERSHIP AND MANAGEMENT

Examine the roles of the design and technology technician, understand effective management systems for the technical service, explore effective communication skills and develop skills to train other technicians and teachers.

- Your school receives: £1,050 ENTHUSE bursary
- Activity fee: £900 (excl VAT)
- 23 April 2018 (3 days)

■ **www.stem.org.uk/ny619**

NATIONAL TECHNICIANS CONFERENCE

Enhance and apply new practical skills and knowledge, discover ways to improve the technical system in your school or college and explore updates to the technicians' profession. Run in partnership with the Association for Science Education (ASE).

- Your school receives: £200 ENTHUSE bursary
- Activity fee: £160 for 2 days (excl VAT)
- 5 and 6 July 2018 (1 or 2 days)

■ **www.stem.org.uk/ny609**

PRACTICAL GENETICS FOR TECHNICIANS

Discover exciting and effective practicals that will help students understand the complex topic of genetics.

- Your school receives: £600 ENTHUSE bursary
- Activity fee: £500 (excl VAT)
- 4 June 2018 (2 days)

■ **www.stem.org.uk/ny632**

TECHNICIANS SUPPORTING A LEVEL PHYSICS

Explore and examine a range of relevant practicals for you to support students with the practical endorsement and skills required at A level.

- Your school receives: £600 ENTHUSE bursary
- Activity fee: £500 (excl VAT)
- 11 June 2018 (2 days)

■ **www.stem.org.uk/ny617**

“This is my third year and this has been the best yet, you always come away with new knowledge and ideas.”

- National technicians conference past participant

TECHNICIANS SUPPORTING BIOLOGY: 11-19

Examine and explore microbiology, biotechnology, genetics, dissections, ecology, microscopy and working with animals and plants.

- Your school receives: £900 ENTHUSE bursary
- Activity fee: £900 (excl VAT)
- 21 May 2018 (3 days)

■ **www.stem.org.uk/ny604**

TECHNICIANS ENRICHING STEM EDUCATION

This activity is packed full of exciting cross curriculum educational projects which will enhance STEM education in your school or college. You will also improve your subject knowledge and increase your pupils' engagement with STEM subjects.

- Your school receives: £1,750 ENTHUSE bursary
- Activity fee: £1,500 (excl VAT)
- 16 April 2018 (5 days)

■ **www.stem.org.uk/ny615**

CPD NEAR YOU

Browse dates and venues online

SENIOR TECHNICIANS: LEADERSHIP, TRAINING AND MANAGEMENT

Designed to enhance leadership and management skills, through examining the role of senior technicians, managing an effective technical service, creating and contacting local groups and training other technicians.

- Browse dates and venues online

■ **www.stem.org.uk/rp602**

TECHNICIANS SUPPORTING A LEVEL BIOLOGY

Developed in collaboration with CLEAPSS, giving technicians an opportunity to learn skills and techniques specifically tailored to supporting advanced level biology.

- Browse dates and venues online

■ **www.stem.org.uk/rp603**

TECHNICIANS SUPPORTING A LEVEL CHEMISTRY

Learn about the key skills and techniques required for the effective support of post-16 chemistry, in conjunction with CLEAPSS.

- Browse dates and venues online

■ **www.stem.org.uk/rp604**

TECHNICIANS SUPPORTING A LEVEL PHYSICS

In collaboration with CLEAPSS we provide you with hands-on experience of a variety of apparatus and experiments, including new software and resources for supporting A level physics.

- Browse dates and venues online

■ **www.stem.org.uk/rp605**

TECHNICIANS SUPPORTING PRACTICAL WORK IN THE CLASSROOM

Understand what makes good practical work, working effectively with teachers and students, assisting with practical project work, and managing small group work and individuals with practical activities.

- Browse dates and venues online

■ **www.stem.org.uk/rp600**

TECHNICIANS SUPPORTING TRIPLE SCIENCE

This course is designed for technicians who support practical work in triple science. You will gain hands on experience of effective and engaging practical ideas in biology, chemistry and physics. You will also have the opportunity to discuss key learning points behind the practicals, where to find resource materials and how to prepare them.

- Browse dates and venues online

■ **www.stem.org.uk/rp776**

WORKING AS A SCIENCE TECHNICIAN: AN INTRODUCTION TO THE ROLE

Understand the role of a technician, general health and safety, policies and procedures, technician skills and working in a science department.

- Browse dates and venues online

■ **www.stem.org.uk/rp601**

“It helped me look at the practicals requested from the learning objective point of view and honed my technical skills ... plus increased my confidence for demonstrations.”

- Technicians as demonstrators, past participant

ONLINE CPD

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 you can best respond to the assessment evidence you get from your students.

- Activity fee: Free
- 16 April 2018 (5 weeks)

■ **www.stem.org.uk/ne702**

SCIENCE OF LEARNING

How can you use the science of learning to improve students' 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**

TEACHING COMPUTING

Develop the skills you need for success in computing, with advice about planning, teaching and learning, assessment and policy.

- Activity fee: Free
- 16 April 2018 (6 weeks)

■ **www.stem.org.uk/ne704**

TEACHING PRACTICAL SCIENCE

Develop your students' learning with engaging and effective practical lessons. Explore how to help your students get the most out of science lessons and the best way to teach practical science and progress student learning.

Biology

- Activity fee: Free
- 4 June 2018 (3 weeks)

■ **www.stem.org.uk/ne707**

Chemistry

- Activity fee: Free
- 25 June 2018 (3 weeks)

■ **www.stem.org.uk/ne705**

Physics

- Activity fee: Free
- 18 June 2018 (3 weeks)

■ **www.stem.org.uk/ne706**

TECHNICIANS AS DEMONSTRATORS

Develop your range of approaches to make science teaching more inspiring and exciting and increase your confidence in carrying out a range of demonstrations.

- Activity fee: £27 (excl VAT)
- 16 April 2018 (6 weeks)

■ **www.stem.org.uk/ne203**

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/ms/online-cpd