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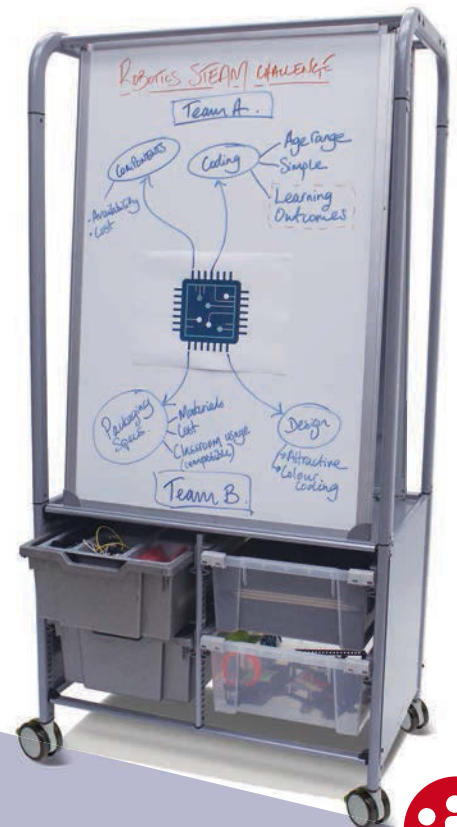


Designed with collaborative learning in mind

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Suitable for any classroom, lab or and maker space, the Callero Plus trolley range offers a portable, modern and modular storage system that is ideal for collaborative learning.

Gratnells iconic trays, inserts and lids are the perfect addition to the range, providing security, order and function to intricate and valuable items.



Editorial

Welcome to the May *Education in Science* (EiS).

A teacher wears a variety of hats – there's a lot more to teaching than just showing up and giving the day's lessons! Much of what young people learn from their teachers is not detailed on a syllabus. As a primary teacher, you probably see the same group of pupils five days a week; as an 11-19 teacher it may be as much as 5 hours per week.

You are therefore one of the most influential people in a young person's life. You might influence them to discover a new sport, hobby, talent, or possibly, through you they may be nudged down a particular career pathway. Do you try to communicate the wealth of careers that are STEM related? If not, is this partly ignorance, or is it a belief that learning about science is its own reward?

I believe that the best teachers are happy to extend their role beyond the science syllabus because they know that it makes their students' educational experience so much more beneficial. Our main feature in this edition is about careers. We open with an article by our President, Sir John Holman, and his involvement with the introduction of the government's Careers Strategy in England. This is followed by articles on careers in primary schools and in secondary/college settings, as well as how one teacher spent two weeks of her summer vacation gaining an insight into STEM careers. Providing an awareness of careers opportunities helps young people to appreciate the wide range of avenues available in an ever-changing world, as well as raise their aspirations, address gender bias and hopefully improve social mobility for those students living in disadvantaged circumstances.

Also in this edition is an article by Janice Griffiths, our Chair-Elect, on the numerous benefits of ASE membership and how to make the most of your membership; she provides an interesting 'iceberg' analogy. Rob Butler, ASE Field Officer, explains how his role initially as a volunteer improved his teaching and led to further career and social opportunities.

It doesn't seem long since we were packing up after a very successful 2019 Annual Conference in Birmingham. We are now well on the way with preparations for 2020 to be held at the University of Reading so, if you are interested in attending or presenting, then please look at page 8 for further details. Before then we have a range of events and other exciting conferences, including what is always a very high quality event, our ASE Futures Conference. This year it will be at Sheffield Hallam University on the 4th and 5th July.

Finally, as this is the last issue of this academic year, I would like to wish you all a restful and enjoyable summer.



Shaun Reason
Chief Executive
Twitter: @ShaunReason

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Education in Science (EiS) is the ASE house magazine and is published four times a year. It is sent to all members as one of the many benefits of membership. The contents of this magazine do not necessarily represent the views or policies of ASE except where explicitly identified as such.

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Printer: Stephen Austin and Sons, Hertford

Publisher: The Association for Science Education (ASE), College Lane, Hatfield, Herts. AL10 9AA.
Registered charity no. 313123

Call 01707 283000
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www.ase.org.uk

© ASE 2019

ISSN 0013-1377

Science Teacher SOS

- Finding teaching has lost its spark?
- Finding it all too demanding?
- Thinking of leaving science teaching?

It may not always feel like it but, as a science teacher, you are a valuable professional and may have several opportunities to make changes to improve your work and life.

First of all, come along to an ASE event (www.ase.org.uk/events). You will

receive a warm welcome and it will give you the opportunity to meet and talk to science teachers from other schools. Many teachers find that this means they can be more open about the challenges they are facing and, at these events, people are very happy to share ideas and suggestions of support.

If you, or someone that you know, are thinking of leaving science teaching, we have made a document for you. It

offers impartial structured advice to help you to consider all your options. The document also includes a work-life balance activity about which we have been receiving very positive feedback.

Before making a hasty decision, please have a read at www.ase.org.uk/sos



EEF Improving Secondary Science report

ASE Research Special Interest Group (SIG) response

In this issue, we aim to give some advice on how to begin to respond to the recently published Education Endowment Fund *Improving Secondary Science* report (EEF, 2018) with a view to helping teachers and schools strengthen their understanding of research-informed practice.

The report is available at <https://educationendowmentfoundation.org.uk/tools/guidance-reports/improving-secondary-science/>

Making changes to practice means teachers rethinking the way they and their learners work in the classroom, and so a teacher must consider and plan carefully.

EEF has selected 7 areas of research: *Misconceptions*, *Self-regulation*, *Models*, *Memory*, *Practical Work*, *Language of Science* and *Feedback*. It is interesting that these seven have been selected, rather than *Dialogic Teaching* or *Collaborative Learning* and, while it is not clear how this selection was made, these seem relevant and robust for strengthening research-informed practice.

Educational research refers to the systematic collection and analysis of data related to specific fields. Some research studies explore

educational settings, others introduce interventions and look at whether a new approach might work and how and why it works, while others seek to implement or inform policy. Some teachers believe that they learn from classroom experience, but research can reduce the amount of trial and error of what works in classrooms. This is why research is embedded into most initial teacher education programmes, helping new teachers to make sense of classroom routines and practices. As teachers gain experience, research continues to be an essential tool in developing expertise.

Regarding both research and professional development, teachers tend to be quite pragmatic, hoping to gain ideas that are specific, concrete and practical and which directly relate to the day-to-day operation of their classrooms (Fullan & Miles, 1992). The main difficulty for any teacher who wishes to introduce new research-informed practice is that they cannot simply add new strategies to their current practice. Instead, they need to gradually make changes to their current practice to allow new ways of working to slip and merge into class procedures and systems. With this in mind, a starting point for any teachers or

science departments responding to the EEF report might begin by discussing and researching one of the seven areas from the report and reflecting on the strengths and areas for improvement that currently apply in their classrooms and teaching. Deciding on a research focus and formulating and refining a research question to explore in your own context provide an essential start to research-informed practice. The next stage would be making decisions about what changes to make in your activities, routines and teaching to bring more of that research idea to the fore. At the same time, you will need to anticipate the likely changes in what your students do, say and produce and find ways to capture the changes that occur in a systematic way. Key to all of this is regular communication and professional dialogue with other colleagues attempting to make similar changes.

The Research SIG has produced a fuller article on responding to the EEF report in the June 2019 issue of *SSR*. We have also planned sessions and research clinics at the Annual Conference in Reading in January 2020 and at regional events in 2020/21.

Alastair Gittner & Chris Harrison are members of the ASE Research SIG.

8 cost-effective principles to tackle the science teacher recruitment and retention challenge

A new report commissioned by the Gatsby Charitable Foundation has outlined eight straightforward interventions that secondary schools can use to improve their recruitment and retention of high-quality science teachers. With the shortage of specialist physics and chemistry teachers continuing to grow, the eight cost-effective and low-risk interventions aim to provide school leaders with a means of taking immediate action to tackle specialist subject recruitment and retention challenges.

Sir John Holman, Senior Adviser to Gatsby and President of ASE, said: *'It is vital we have enough teachers to ensure a robust science education for all, irrespective of background or economic circumstance. The recently announced Government strategy to bolster the recruitment and retention of teachers presented clear and coherent initiatives, which will not only attract teachers to the profession but retain those that we have – but these will take time to implement. The principles in Gatsby's latest report provide school leaders with*

steps they can take in the meantime to



bolster science teacher numbers'.

To read the full report, please visit: www.gatsby.org.uk/uploads/education/increasingscienceteachers-web.pdf

To read more about Gatsby's Teacher Recruitment, Retention and Development programme, visit: www.gatsby.org.uk/education/programmes/teacher-recruitment-retention-and-development

The GSK UK Young Scientist & GSK Young Engineer of the Year Awards

Maeve Stillman, from St Mary's College in Derry, and Grace Lord, Brendan Miralles and Aalia Sellar from Loughborough Schools Foundation saw off tough competition from over 1100 entries to be awarded the top honours of GSK UK Young Scientist of the Year and GSK UK Young Engineer of the Year at The Big Bang Fair in Birmingham in March 2019.

The two awards are the top accolades in The Big Bang Competition – an annual competition for young people aged 11-18 in full-time education or training – designed to recognise and reward achievements in all areas of STEM, whilst promoting vital STEM skills and confidence in project-based work.

15-year-old Maeve aimed to improve our understanding of how activated charcoal affects the absorption of everyday medicines, including paracetamol, for her winning project. 'Music Splash', the project from

Loughborough's team, was inspired by a need for better access to music education and is an app that uses machine learning to analyse music performance and provide feedback that helps the user to improve. The standard of creativity in this year's awards was exceptionally high, with other ideas including everything from aids for the visually impaired to sustainable fertiliser, and edible water bottles to a door with facial recognition.

Previous winners of the competition, which is now in its fourth year, have



L-R: Greg Foot, Emily Xu (2018 GSK UK Young Scientist of the Year), Maeve Stillman, Nikki Yates (GSK).

gone on to forge successful careers in STEM, compete at international awards and present their groundbreaking concepts on television. This year's winners will continue to show their ideas to the thousands of visitors to the annual Big Bang Fair at the NEC in Birmingham, which aims to inspire other young people to consider a career in STEM by showcasing the huge depth and breadth of opportunities available in the sector.



L-R: Maddie Moate, Josh Mitchell (2018 UK Young Engineer of the Year), Grace Lord, Aalia Sellar, Brendan Miralles, Chris Hurst (GSK), Hilary Leever (CEO, Engineering UK).

The National Education Show

This event is the biggest annual all-day conference and exhibition on education in Wales and will be coming to Cardiff City Hall on 25th October 2019.

The event will recognise and celebrate the challenges, successes and innovative developments that teachers encounter every day. It is aimed at headteachers, school business managers, teaching staff and teaching assistants, SENCo staff, coaches and PGCE students and includes a jam-packed programme of 40+ innovative and informative keynote seminars on the very latest topics, developments and research in education, presented by professionals at the forefront of the industry, and an exhibition featuring 100+ products, supplies and services catering for the education industry.

For more information, please visit www.nationaleducationshow.com



NFU's Farmvention competition

NFU Education have welcomed over 2000 children from across the UK who entered their first ever Farmvention competition. Nine final entries were chosen and the lucky finalists won the opportunity to present their ideas at the Houses of Parliament, along with a farm visit for their class and a range of amazing STEM prizes for their schools. One lucky finalist, Ronald Ross Primary School from the London Borough of Wandsworth, was selected as the overall winner and has won the grand prize of the school being turned into a farm for a day!

The competition, launched in September, asked primary-aged children to submit entries that solved one of three farming-related issues using science, technology, engineering and maths (STEM):

- Design a tractor of the future
- Design an environment for a flock of 100 laying hens
- Design a new snack product from four British ingredients



Some pupils from Ronald Ross Primary School, with the NFU President, Minette Batters.

Each of the nine finalists came up with ingenious solutions to one of the above challenges. The overall winner, Afeefa Haroon from Ronald Ross Primary School, presented a zip line tractor project. Afeefa solved the problem of soil compaction by designing an ingenious, eco-friendly zipline model from which automotive farming machinery could be hung – an amazing and well thought through idea! More details about the competition and all nine finalists can be found here: www.nfueducation.com

For more about NFU resources, please see page 26 of this issue.

Key moments in history and science – a fossil hunter's story

This new ASE project is producing teaching resources and professional learning strategies for primary teachers of children aged 9-11 years to support their knowledge and understanding of the big ideas of evolution, the nature of scientific enquiry and the strengths and limitations of scientific knowledge.

The project employs the fascinating story of Mary Anning and her fossil discoveries as a stimulus for children to develop their awareness and understanding of the big ideas of evolution, the evidence and ideas that led to them, and how

these have developed since the time of Mary Anning and her contemporaries in the 19th century.

With a format similar to ASE's award-winning *Why You'll Never Catch Smallpox*, these teaching resources revolve around a compelling 15-minute drama film about the young Mary and her discoveries. Children will be inspired by the story of someone their own age driven by a burning scientific curiosity about the natural world and the origins of life. These resources also include a combination of immersive

role plays (with children taking on a range of roles when working with different resources of the project) and opportunities to interact with authentic historical and modern day sources and to develop their knowledge, skills, understanding and perspectives through cross-disciplinary interactions (particularly English and science literacy, history and religious education).

This ASE *Key Moments in History and Science* project is supported by the Templeton World Charity Foundation. See www.ase.org.uk/evobigidea

Teaching argumentation in science and religion

The new 3-year OARS Project (Oxford Argumentation in Religion and Science Education), based at the University of Oxford, is investigating how arguments work in science and religion.

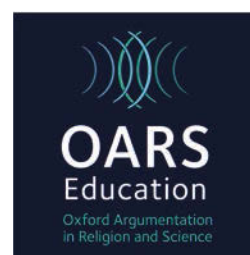
The relevance of arguments in science education is that teachers and pupils often face difficult judgements that demand understanding of various kinds of information, opinion, values and ethical principles, and understanding of different processes of argumentation, deliberation and debate. For example, in the context of biology lessons, pupils might question whether or not genes should be cloned or edited, appealing not only to scientific knowledge but also to religious and ethical values. Some

teaching and learning scenarios might demand teachers and pupils to consider scientific and religious issues together. For instance, pupils might ponder about religious values related to end-of-life decisions in conjunction with scientific evidence on the sustainability of life. Many complex everyday problems thus require cross-curricular conversations in order for teachers and pupils to make judgements about a whole range of issues that have both scientific and religious undertones.

Hence, the aim of the OARS Project, funded by the Templeton World Charity Foundation, is to understand how argumentation works in science and religion, and how best to support pupils in learning arguments. Thirty science

and religious education teachers are collaborating with researchers and teacher

educators from Oxford in a professional development programme to develop their pupils' understanding of argumentation. Eventually, the project will provide data on about 1500 pupils. Further information is available at www.education.ox.ac.uk/research/argumentation-in-religion-and-science/ and any interested teachers may contact the Principal Investigator, Sibel Erduran at Sibel.Erduran@education.ox.ac.uk



A new national STEM initiative

The Youth Industrial Strategy Competition



This competition will see 11-19-year olds undertaking STEM projects on topics related to the four Industrial Strategy Grand Challenges: *AI & Data*, *Ageing Society*, *Clean Growth*, and *The Future of Mobility*.

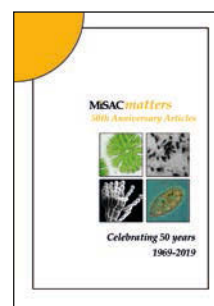
The competition has been developed in partnership with the British Science Association and the Department for Business, Energy & Industrial Strategy and calls on school students to come up with innovative solutions that have the potential to change our future industries, society and the environment using cutting edge research and ingenious product designs.

Entries that meet the Youth Industrial Strategy Competition criteria will also be eligible for the CREST Awards, the BSA's flagship education scheme that rewards STEM project work and

encourages young people to think and behave like scientists and engineers. Based on the guiding principles of the CREST Awards, Youth Industrial Strategy Competition projects will be student-led, with a clear Grand Challenge-themed idea at their core. They will also give young people the chance to boost skills such as teamwork and communication, as one of the key criteria for the projects is that the students reflect on what they've learnt.

The competition is now open for entries until November 2019. The finalists will be announced in January 2020 and invited to participate in The Big Bang Competition in March 2020, where a special prizewinner in each of the three Youth Industrial Strategy Competition categories (Junior, Intermediate and Senior) will be awarded. For more information, please visit www.yisc.org.uk

Free articles from MiSAC



To commemorate its 50th anniversary, the Microbiology in Schools Advisory Committee (MiSAC) has produced a series of short

illustrated articles, aimed at secondary school teachers and students, but also of interest to a wider audience. The MiSACmatters Anniversary Articles collection is introduced by a foreword from Sir Paul Nurse FRS and comprises over 30 articles written by leading microbiologists. To learn more about the amazing contributions of microbes to plant and animal health, and to maintaining the world around us, please visit www.misac.org.uk and follow the links to the Anniversary articles collection.

Share your enthusiasm at the ASE Annual Conference

From 8th-11th January 2020, the ASE Annual Conference will be returning to the University of Reading. For the Conference, we build up a programme of over 450 CPD sessions. This includes activities from the classroom, action research, new resources and inspiring practicals: so this is where you come in...



Do you have an idea to share with science education colleagues from around the world? The Annual

Conference is an impressive event, attracting around 2300 delegates. BUT running a session does not have to be intimidating; it is the chance to share your work with similarly enthusiastic science educators:

- Share ideas and practical activities from your classroom
- Showcase a new resource
- Provide updates on subject knowledge
- Present research approaches and findings
- Examine assessment
- Launch an initiative or new programme.

Everyone is welcome to submit a session idea, both ASE members and non-members. If you have an interest in science education and have something to share, then we'd love to hear from you. All you have to do is complete an



online proposal form by **31st May** at: www.surveymonkey.co.uk/r/AC2020

Everyone leading a session has to register as a conference delegate, but ASE offers a bursary to cover one day's registration for all teachers, people from not-for-profit organisations and those self-funding. So you could get the learning benefits of leading a session and get a full day's CPD by attending other people's sessions.

To find out more about anything mentioned on this page, email conferences@ase.org.uk

If you do not want to lead a full session, there are more collaborative, informal ways in which you can share your enthusiasm:

▶ **Create a poster display in the Schools' Exhibition: Friday 10th January 9am–12pm**

This very popular part of the Annual Conference brings together ideas from the classroom across primary, secondary and FE. Every teacher who books to exhibit is given a poster board and table to showcase a teaching approach and talk to delegates about their ideas. ASE has taken on the co-ordination of Science on Stage UK and so the Schools' Exhibition will also feature the teachers who will have represented the UK's science teaching at the Science on Stage Festival in Portugal in October 2019.

If you take part in the Schools' Exhibition, you qualify for a free day at the ASE Annual Conference.

▶ **Create a research poster: Saturday 11th January**

The ASE Research Committee will be hosting a poster-sharing session. Everyone who has been part of a research project (including classroom-based research) is invited to present a poster on their work.

▶ **Share primary inspiration**

There are two excellent collaborative sessions as part of the Primary Programme. On Friday, the Primary Pop-up brings together an exciting array of tabletop, hands-on activities created by primary teachers. On Saturday, the Primary TeachMeet is a lively, informal session where

teachers can present a three-minute idea. Both of these sessions are a great way to begin sharing your ideas.

▶ If you want to leave the presenting to others, then of course you can attend the Conference as a delegate and enjoy the full breadth of the CPD on offer. Just go to www.ase.org.uk/events/ase-annual-conference-2020 for more information.

		1 Day	2 Days	3 Days	4 Days	Saturday only	Twilight only (Thurs 3-7pm)
ASE Member	Early Bird (book by 25 October)	£112	£201	£234	£245	£99	£25
		£124	£223	£260	£273		
Non-member	Early Bird (book by 25 October)	£223	£401	£468	£491	£198	£50
		£248	£446	£520	£545		
Member Trainee Teacher	* When you join ASE from only £4 a month	FREE*	£49	£79	£99		



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Getting into careers

Professor Sir John Holman



Sir John Holman

Emeritus Professor of Chemistry at the University of York, President of the Association for Science Education and author of *Good Career Guidance*.

I've been a chemistry teacher, at school and university, for most of my career but, over the years, I've become increasingly interested in career guidance. Why would a chemistry teacher get so interested in careers, other than his own?

I had an early epiphany when I was a headteacher (1994-2000) and realised that career guidance is the key to social mobility. Many students look to their parents and family friends for advice on future choices but, if there is no one in the family who has ever had a skilled job, where are they to look? School is their best hope.

Like all teachers, I'm highly motivated by wanting my students to continue studying the subject that I teach them – to continue to A-level and beyond. When I was National STEM Director for the government (2006-2010), I thought a lot about how to get more young people interested in studying STEM subjects on academic and vocational routes. I realised that one disadvantage we have with STEM is that, like it or not, these subjects are perceived as being difficult. I thought to myself, 'Why would students choose, say, maths or physics if they think it's going to be difficult to get a high grade?' Then I realised that, if students knew the rewards that lie ahead in the form of interesting, well-paid careers, they might be more prepared to tackle those 'difficult' subjects.

Good career guidance

So when, in 2013, the Gatsby Foundation asked me to find the answer to the question 'What does career guidance look like when it's good?', I jumped at the chance. With experts from the University of Derby, I visited six countries in which career guidance is known to be good (see Box 1).

In each country, we visited schools and colleges and met careers specialists, students, employers, headteachers, teachers and government officials. From all these experiences, and from what we already knew about schools in England, we drew up eight benchmarks for good career guidance – the Gatsby Careers Benchmarks. They are listed in Box 2.

The detailed criteria for reaching the Benchmarks are in the report *Good Career Guidance*, published in 2014. In 2015-2017, we carried out a highly successful two-year pilot of the Benchmarks in 16 schools and colleges in North East England. This pilot showed that the Benchmarks work, because they tell schools, colleges and employers what they need to aim for to provide career guidance that is world class. The Gatsby Benchmarks were adopted in 2018 by the Department for Education as the basic framework for the government's Careers Strategy for English schools. The governments in Scotland and Wales are also taking a close interest in the Benchmarks.

What has all this to do with education in science?

If you look at Box 2, you will see that Benchmark 4 is called *Linking*

curriculum learning to careers. When we visited countries such as Finland and Canada, we found that science teachers feel a strong sense of responsibility to show their students the careers that can come from the subject they are teaching – be it biology, chemistry, physics or whatever. Classroom teachers are the people who see students day in, day out, and they have frequent opportunities to tell students about the careers linked to curriculum content: for example, radiography technician (physics), food analyst (chemistry) or conservationist (biology).

This isn't just about giving your students career guidance; if you can show them the rich and rewarding careers that come from science, you will engage and motivate them to take science seriously and to take it further. And it doesn't always have to be you doing the telling; you can invite a practicing scientist or technician to come and talk to your students, to provide a role model as well as up-to-date information about the applications of science. At the end of this article, I've provided a few examples of sources where you can find help with careers in the (science) curriculum.

Box 1. Six countries where careers guidance is considered to be good

	The Netherlands
	Germany
	Hong Kong
	Finland
	Canada
	Ireland

Box 2. The Eight Gatsby Benchmarks for Good Career Guidance

1	A stable careers programme
2	Learning from career and labour market information
3	Addressing the needs of each pupil
4	Linking curriculum learning to careers
5	Encounters with employers and employees
6	Experiences of workplaces
7	Encounters with further and higher education
8	Personal guidance

Good career guidance has never been more important. The world of work is changing rapidly and today's students are likely to follow several careers in their working lives. The opportunities open to them are breathtaking, if only they know where to look and the right choices to make (and you can't go far wrong with the choice to take maths and sciences). Technology is making new careers possible, but it is also widening still further the gaps between

advantaged students who know where to look and the choices to make, and the students from homes where help is limited. It's part of our job as science teachers to show students the many doors that science can open for their future lives.

Sources

Gatsby's *Good Career Guidance* report, including signposting to other sources: www.goodcareerguidance.org.uk

STEM Learning has an extensive range

of resources about STEM careers: www.stem.org.uk/stem-careers

Professional institutions such as the Royal Society of Chemistry (www.rsc.org/careers/future/) and Engineering UK (www.tomorrowsengineers.org.uk/) offer detailed information about specific careers.

The Careers and Enterprise Company has a directory of activity providers, which you can filter by Benchmark: www.careersandenterprise.co.uk/find-activity-provider

The *Technicians Make it Happen* site has a section for teachers to help you show your students careers as technicians: www.technicians.org.uk/teacher-career-advisor

Growing into careers in primary education

Carol Davenport

When should careers advice, information and guidance start in schools? For many years, careers support was offered to young people at key decision points: GCSE and A-level options.

However, our research at Northumbria University shows that, even before the age of 8, children are starting to make decisions about the sort of jobs they would and would not like to do. And, rather alarmingly, there is a strong gender dimension to their STEM-career choices, with girls tending to say that they would work in biological or health care and boys leaning towards jobs in the physical sciences or technology. Even at this early age, children have imbibed the messages from the world around them about gender-appropriate jobs, and start to limit their possible futures because of these. To tackle this, we've been working with over 30 primary schools to explore how teachers can provide careers support to their pupils from early years and upwards.

Firstly, it's important to make sure that the support is age-appropriate. Howard and Walsh (2009) use a Conceptions of Career Choice and Attainment (CCCA) model to describe how children's conceptions of jobs, and how to

attain them, change with age. Initially, children use fantasy, imagination and role play to put themselves in different careers, often basing their choices on associations with heroes or role models (for example, YouTubers, footballers or teachers). However, there will be little self-reflection about their own preferences and abilities, and they don't know how someone might get a particular job. As children become older, they start to identify cause and effect: how they might find out about a job and choose one they like, as well as beginning to be aware of their own interests and how they might link those to a job. Finally, as they mature into young people, they come to understand the interaction between personal attributes, job characteristics and system factors (e.g. local job markets), and how the interplay between these can shape job choices. This final approach to careers is unlikely to be attained in primary school, but the children will develop in their thinking from fantasy and role play to becoming aware of their own interests, and have a more realistic view of jobs.

The Citizenship programme of study¹ outlines the breadth of opportunities to which children can be exposed in

primary school and that children should be taught '...some of the ways people look after them' (Key Stage 1, ages 5-7) and 'about the range of jobs carried out by people they know, and to understand how they can develop skills to make their own contribution in the future'. Whilst citizenship isn't statutory, it does provide a helpful framework for schools when thinking about putting careers in their curriculum. Using this, and the CCCA model, allows teachers to plan careers interventions throughout a child's time at primary school that build on their current understanding of jobs, and supports them over time to develop a broader understanding of different careers. Teachers can also use them to challenge the stereotypes that children hold about jobs.

Ideas for careers

Starting from Early Years and the Foundation stage, teachers can include a wide range of role play opportunities and link them to different careers. One popular role play is construction, but it can be taken beyond the obvious jobs (builder, bricklayer, plumber) and include broader opportunities (town planner, surveyor, architect, interior designer) by including measuring and drawing equipment in the role play area, to allow children to ►

► explore more widely. This can also be complemented by a careful choice of storybooks; for example, *Iggy Peck, Architect* by Andrea Beaty would work well.

As children get older, and the demands of the curriculum increase, it can feel harder to carve out time to dedicate to careers. One way to overcome this is to include careers ideas into regular teaching and link careers to the subjects that children are learning about. However, teachers may have a fairly limited knowledge of the range of different jobs, particularly linked to science topics. At NUSTEM, we have developed an online Primary Careers Tool² to help teachers to broaden the range of careers that they know about and include in their teaching. The tool is a database of over 100 careers, sorted by National Curriculum science topic, with a short description of the career, three attributes that people in that career might need, and a link for counter-stereotypical images of that type of person. For example, if the

topic is 'Earth and Space', then one of the careers is 'astronomer', or 'satellite communications engineer', and the attributes are 'committed', 'organised' and 'resilient'. It doesn't take long to put this information into a presentation slide that can be used in the science lesson. The teacher asks the children if they could do that career, and if they share any of the attributes named. This helps children to start to consider how their personal attributes and interests could help them in a future job.

Similarly, we've also developed the 'STEM Person of the Week'³ – a five-week teacher-led project for primary schools. Again, this focuses on a range of different characteristics that children might need to succeed in different careers. The aim is not to persuade more children to take up the specific STEM careers, but to get them thinking about how the things they enjoy and the characteristics they have might help them in future careers, linking with the second stage of the CCCA model.

Careers in the primary classroom are starting to hold more prominence, with external organisations such as the Careers and Enterprise Company⁴ and Founders for Schools⁵ looking at how to support primary teachers to embed careers into the primary school. With some careful planning and thinking, primary school teachers can help their pupils to broaden the range of jobs that they know about and think that they could do.

References

¹https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/402173/Programme_of_Study_KS1_and_2.pdf

²<https://nustem.uk/primarycareers/>

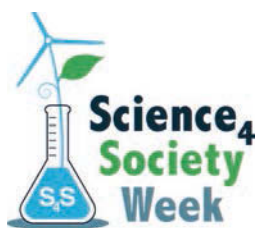
³<https://nustem.uk/stem-person-of-the-week/>

⁴<https://www.careersandenterprise.co.uk/schools-colleges/primary-school-support>

⁵<https://www.lkmc.org/wp-content/uploads/2019/04/Making-Careers-Education-Age-Appropriate-digi.pdf>

Dr. Carol Davenport CSciTeach is Senior Lecturer and Director, NUSTEM, Faculty of Engineering and Environment.

Globally Responsible Careers



What answers do you get when you ask young people about their career aspirations and how

these roles could be made more globally responsible? Below are some responses from the winners of the Science4Society 2019 competition, run with ASE.

The quality of the entries was very high, making judging a challenge.

'My dream job would be an environmental scientist as they conduct research to identify and try their best to eradicate pollution' (Jesslyn Harini Vijeyanathan, age 11, winner of the age 7-11 category).

'This job designs ways to protect ecosystems, biodiversity and wildlife, while also planning ways to solve water waste, prevent food waste and promote recycling' (Katie Bean, age 14, winner of the age 12-14 category).

'The medical industry is one which is constantly evolving and will always be required so it will become increasingly key that it becomes more sustainable' (Ellen Hutton, age 16, winner of the age 15-18 category).

Science4Society runs an annual competition, which this year focused on Globally Responsible Careers, asking young people to consider their career aspirations and how this might impact on the environment. By considering what scientific issues are involved, students were able to make the links

between their career choices and how they could make those jobs more globally responsible. Given the current climate emergency, it is important for these young people to think now about what positive difference they can make through their choice of job and employer.

Science4Society Week is a collection of science education activities, co-ordinated by Scientists for Global Responsibility and designed to inspire young people. The activities focus on the contribution that science, design and technology can make to peace, social justice and environmental sustainability. The project was set up to provide an alternative to activities funded by the arms and fossil fuel industries. Science4Society resources are free and downloadable from www.s4s.org.uk

An INSIGHT into future careers – with STEM Learning and Network Rail

Wendy Pearmain

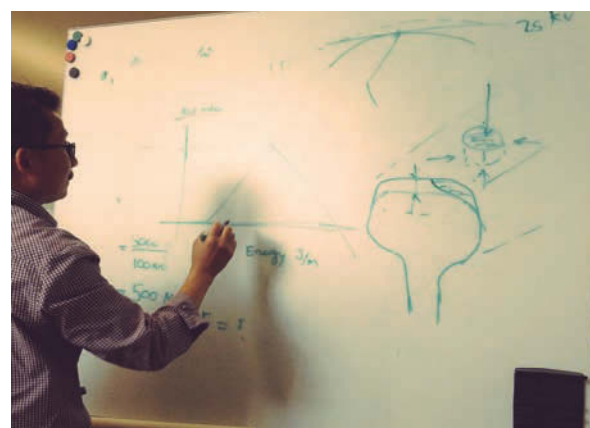
It's the first day of the summer holidays and I wait in quiet contemplation for the 8am train to Milton Keynes. A quick read through the pre-placement paperwork reveals a community of past 'insighters': educators who, like me, grabbed the opportunity to experience life in a cutting-edge industry or university. Rewind four months and I enthusiastically signed up for the STEM Learning Insight Placement programme. The initiative promises educators the chance to spend up to two weeks immersed in the world of STEM careers and further study. Within two weeks it was confirmed: I was going to spend a week at Network Rail Headquarters, Milton Keynes.

Why did I sign up to work through part of my holiday, despite a long and challenging last term? The idea grew from my desire to supplement my lessons with up-to-date applications of science and career information. Prior to teaching, I worked in petrochemical and trace organics laboratories and, although I enjoyed sharing anecdotes about the techniques and applications of physics and organic chemistry, my knowledge was over fifteen years old. When students asked for guidance about STEM careers, apprenticeships and further study, each year I felt less informed. As Director of STEM, I had invited ambassadors into school, run projects and supervised enrichment trips, etc., but was still frustrated with my lack of first-hand experience. So, rather than an industry-based secondment (which would be fantastic), the Programme provided the next best thing, to work for a short period of time alongside real-life STEM teams.

I was due to meet Caroline, Principal Engineer at Network Rail. Caroline had created a bespoke experience tailored to my interests: working alongside female STEM ambassadors and the chance to observe the applications of forces, circular motion, harmonic motion and electricity. Caroline also arranged for me to sit in on various operational meetings, including one where stakeholders from across the Network discussed a bid for European Union funding. During my week, there were many parallels to working in schools; I was struck by the similarities in data collection language: *'We need to be able to maintain and predict so that we can respond and minimise failures, plan for super-red reduction – if you ignore this red flag, then you do so at your peril!'*

Daniel, on secondment from BAE Systems, patiently demonstrated how train velocities and track dynamics are analysed along the miles of track. He described his training journey from school and his reasons for working in the creative design STEM industry. Hearing Daniel's training history, and that of the other team members, demonstrated the numerous routes through STEM careers, including the importance that industry now places on apprenticeships. At school we tend to disproportionately promote STEM university courses compared to apprenticeships. Industry values in-house training, apprenticeships and STEM graduates in equal measure. Network Rail, for example, has a range of training opportunities for school leavers up to graduate traineeships.

Later, Patrick, a structural engineer, offered to work one-to-one with me to provide examples of the applications of physics related to the rail network. We covered stress, strain, voltages, centripetal force, resonance, wheel/rail interface – all in one hour! Armed with a plethora of examples, I set about creating scenario-based lessons in which students adopted the role of fault-finding structural engineers. To say that the experience was invaluable is an understatement. It has galvanised my belief that science teachers should be given the opportunity to be immersed in STEM applications and careers. I have gained experience about the application of science, the training opportunities and STEM careers, but was also presented with ideas for working effectively in a team and how to use large volumes of data. The opportunity has rekindled my passion for STEM education, prolonging my desire to stay in the classroom and enriching the curriculum with opportunities to work with STEM ambassadors and extended projects. Many teachers have entered the profession straight after gaining their ▶



Structural engineer Patrick working with Wendy to identify applications of physics to enhance GCSE and A-level physics.

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Belonging to ASE – the tip of the iceberg

Janice Griffiths

I am Chair-Elect of ASE this year, working with Mary Whitehouse (current Chair) and Linda Needham (Past-Chair). Some years ago, these would have been names that I saw on research papers, as part of national programmes or delivering at national events, and here I find myself working alongside them in the Chair Trio. This exemplifies one of the key benefits that has kept me actively involved with ASE, since I was encouraged to join our local region group (Southern Counties) during my PGCE year at the University of Southampton – the chance to meet and work with a huge range of people involved in science education who I would otherwise not have met. And so I have benefitted from this interaction personally and professionally.

After joining the local region group, which organises events for teachers and technicians in our locality, I spent a couple of years hearing about various committees (11-19, Primary, Publications, etc.) and feeling like

the 'newbie'. However, through contributing to activities and events, and gradually becoming more involved, I learned more about ASE and how it works through its wonderful population of volunteer members. And my confidence grew. I was at ASE HQ to discuss the upcoming Annual Conference 2020 (at Reading) recently when four committees were meeting. So many 'big names' in science education were there, and I personally knew most of them!

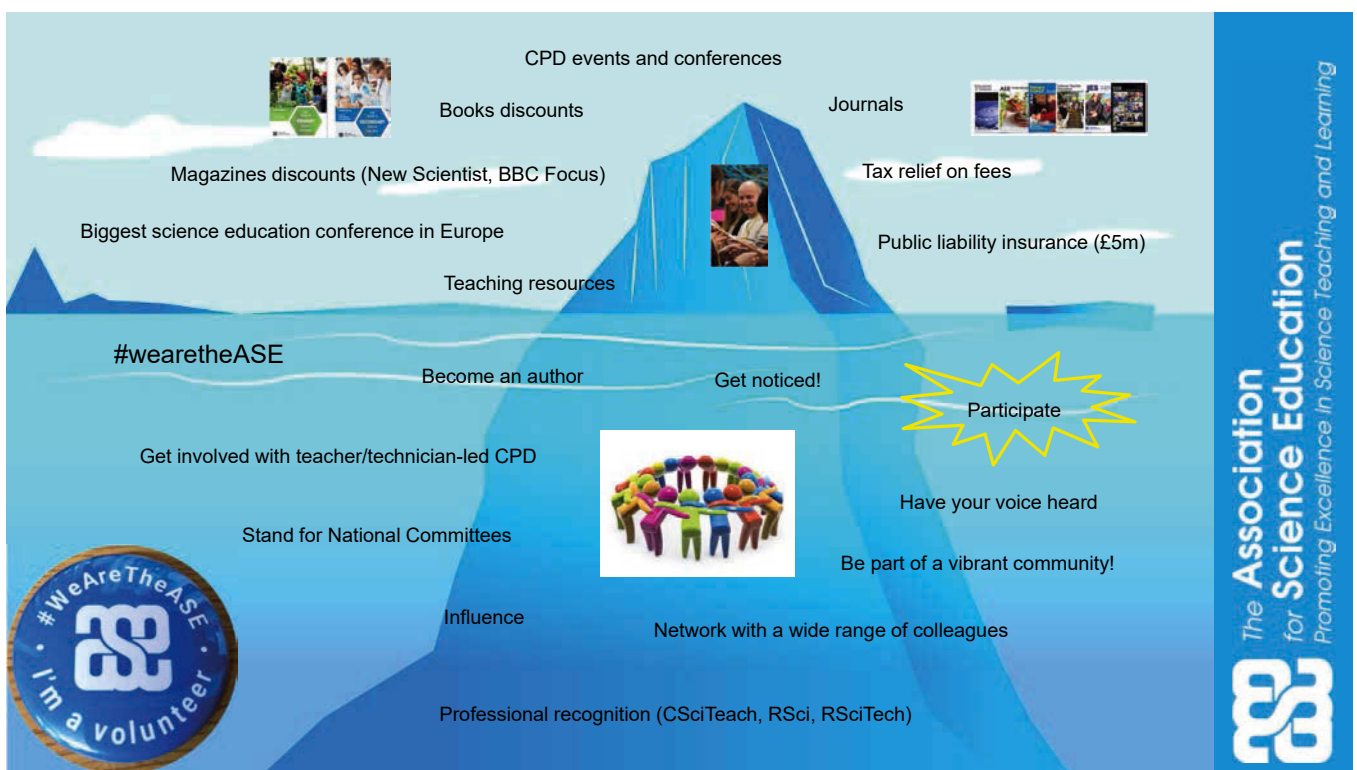
Recent ASE Chairs have focused on the collective social and science education capital that underpins ASE, culminating in this year's #wearevolunteers badges. We have discussed the benefits of active membership of ASE at Education Group and this has led us to develop the 'Iceberg' analogy.

Simply, there are numerous benefits to ASE membership that we can identify and communicate – access to high quality journals and publications,

professional indemnity insurance, professional development programmes for and by members, and more. These are what we call the 'tangibles'. However, possibly even more important are the 'intangibles' – the extensive networking, becoming an author, being 'noticed', becoming an accredited teacher or technician and having our voices heard – individually and collectively. These intangibles, however, will only happen when you actively participate in ASE, be that through representation on various groups and committees, getting involved with local events or activities, or attending the plethora of events that ASE volunteers run.

So...don't wait! If you are a member (or not) and want to invigorate your practice, get involved with ASE: #wearevolunteers!

Prof. Janice Griffiths CSciTeach
ASE Chair Elect
2018/2019



The Association for Science Education
Promoting Excellence in Science Teaching and Learning

Improve your network and enhance your skills... volunteering with ASE!

We recently said a sad and reluctant farewell to Janet McCartney, who retired from her position on our ASE regional committee. Janet has been a very active member of the Committee and she found that volunteering for ASE was the perfect match for her job as a local authority science consultant – both shared a common aim to improve science education for all. As we thanked Janet for her contribution over so many years, I started to reflect on volunteering for ASE.

I've been a member of ASE for a very long time, although to start with I wasn't using my membership to its full potential. I decided to attend a local CPD event, which was excellent in its own right and, while there, I was invited to join the regional committee. As a sole practitioner in a small department, it was great to meet other teachers with a passion for science education.

By becoming involved with the committee I helped to plan CPD events and expand my network of teachers from a range of settings across all phases of education. My involvement grew and I was encouraged to stand for our national committees: I've been a part of Education Group, Publications and the 11-19 Committee and have recently taken up the position of ASE Field Officer.

I thank the ASE (and the opportunities that being a volunteer offered) for the extensive network I have now. Being an ASE volunteer improved my teaching (through the sharing of ideas) and kept me sane by having a supportive network of colleagues (many of whom I now call friends) to lean on.

I asked colleagues why they volunteered for ASE and this is what they said:

'I volunteered to join an ASE committee when I started working at IOE, i.e. when I was no longer working full time in a school. It had been impossible for me to attend the national conference unless I was speaking, prior to leaving the classroom. My rationale was that, after 20+ years of benefitting from journals and local events, it was time to give something back to the community that has supported me so well. What I get out of it is a good connection to teachers and schools and the opportunity for CPD through informed and in-depth discussions with teachers and academics on ASE committees' (Sheila, regional & 11-19 committees and teacher trainer).

'Through being an ASE volunteer, which started as a regional committee member many years ago, then being elected onto national committees and then as a Trustee, I have had unexpected opportunities to do things and meet people I wouldn't normally come across. I have found these experiences energising and always learn something good from them. Over the years as a volunteer within different roles, I have grown in confidence and knowledge about science and education. It is well worth the time and effort as I not only feel happy about supporting ASE but I get back so much' (Sally, regional committee and ASE Trustee).

'I have been a primary science leader for 10 years and have been encouraged, mentored and helped in transforming science in our school from just another subject to one that teachers like teaching and pupils like doing. I volunteered to help with ASE as I wanted to help and support others to achieve a positive change in their own classrooms or schools. I also get to mix and mingle with a great bunch of people who have great ideas and are doing amazing projects' (Sarah, regional committee and primary teacher).

'Great opportunity to meet more people with like minds and similar passions for science. It's amazing how many new friendships I've built from my volunteering with ASE' (Jane, regional committee and primary teacher).

'I volunteer because I want young people to have a positive experience of science in school that either inspires them to follow a career in science or helps them understand the world they live in' (Bel, regional committee and primary teacher).

There are many ways you can volunteer for ASE:

- Host a TeachMeet, or speak at one
- Join a regional committee
- Sit on a national committee
- Write articles for ASE journals
- Join in #ASEchat on Twitter
- Introduce your colleagues to ASE membership

Remember, ASE is what our members and our volunteers make it, and what we want it to be! #WeAreTheASE

Rob Butler
CSciTeach is
ASE Field Officer
North and East
Midlands



Ensuring Cinderella goes to the ball

Dave Grosvenor

The findings of a recent Ofsted report 'Intention and substance: further findings on primary school science from phase 3 of Ofsted's curriculum research' (February, 2019) unsurprisingly revealed the provision for English and mathematics to be much stronger than for science. In fact, the study showed that science and most of the foundation subjects that are not included in SATs often had weaknesses in the curriculum design that were not present in English and mathematics. This article explains why this happens and how schools can address the issue.

It is a sad fact that foundation subjects not included in SATs are often left out. Like Cinderella, primary science suffers as a subject; while her two sisters (maths and English) go to the ball, poor old Cinderella is left at home.

The recent Ofsted report is hardly surprising to many science-focused teachers. Schools are under pressure to raise standards in the core subjects, especially when they are assessed in SATs. With science excluded, the result is that it tends to be squeezed out from going to the ball for three main reasons: time, money and knowledge.

Getting to the root of the problem

Our current school system is naturally dominated by what is tested. When science was dropped from being measured in SATs, it increasingly became timetabled out: assessment leads and curriculum follows. As the old saying goes, we should of course measure what we value, not value what we can measure. However, driven by accountability from Ofsted and the Department for Education, the teaching profession has been the unwilling accessory to the increasing dependence on SATs.

This is exacerbated by tightening budgets and no ring-fenced funding, which means that resources in schools are often scarce. With the sciences in mind, this is particularly relevant. Many of the resources designed to teach the science curriculum are not cheap; if we wanted a trombone to study wavelengths, we'd also need the equipment to measure the wavelengths. If we truly want more pupils skilled in STEM subjects, science should have the same budget as maths and English. The fact remains though that, if one foundation subject is going to attract less investment, it will be science.

The third reason for science being the Cinderella subject loops back to points one and two. As the sciences are not given the attention they deserve in primary schools, fewer students are excited and drawn to these subjects. This causes fewer teachers with science as a specialism to come

through college, creating a dearth of science-savvy teachers.

What can we do?

The most exciting part about science is that it's rooted in curiosity and, when we are born, we come fully loaded with curiosity; we want to know why the sky is blue and the grass green, where the Moon goes in the morning and what makes rainbows. What we really need to do is capitalise on this natural thirst for knowledge. In science, questions become oxygen. We want pupils to explore the subject.

So, what can be done? This is not a call for science to be assessed so that it gets the same amount of attention as English and maths. The other subjects may be measured and tested, but you can't fatten a pig by weighing it. If anything, I'd like it to receive ring-fenced funding rather than being measured, although I do believe that we should be moving to an examination

Key findings from Ofsted's report

- Mention of science in primary school inspection reports has risen over the years and, in 2017/18, was included in 61% of reports, but this is still much less than the 100% that mention maths.
- In secondary school reports, mention of science also increased to 87%, only 12% behind maths.

'We understand the incentives that have led some schools to de-prioritise science. However, there is clearly enough room within the timetable to ensure that young people can master the essentials of English and mathematics at the same time as building their knowledge in science' (Ofsted, 2018).

Ofsted: What success looks like

The one school providing a successful science curriculum in the sample was providing coverage over whole science units in depth and with progression over and across years. Appropriate sequencing of content to build pupils' understanding of scientific concepts was particularly evident in this school. Leaders were also using assessment effectively to recognise that areas of working scientifically were weaker. This had led to the subject leader delivering further training and support to other staff to make sure that practical science activities helped to improve pupils' knowledge and conceptual understanding.

system that better reflects the needs of the 21st century labour market. However, if we focus on funding then it becomes clear that this is not a case of throwing resources at science and expecting it to make all the difference. When we consider the necessary resources to really engage children in science, the biggest resource is the teacher. We are the most resourceful and inventive creatures; if I were teaching sound waves with a limited budget, I would use paper cups and wet string rather than a trombone and expensive sound equipment. I beg and borrow any resource that will pique their curiosity.

That said, there must be a valued, scientifically correct, trusted resource. I use a questions-based resource to drive engagement, which complements the practical side of scientific discovery incredibly well. We take a question and then pupils go and investigate. When

they return, we use questions to ascertain what they've learned and to help develop their understanding. The system recognises if the child has fully grasped the learning objective

and, in turn, either gives them hints and an easier question or moves them on to the next level. It is good to make use of the many teacher communities on social media; recommendations, advice and reviews of resources are rarely in short supply. Teaching can feel like an isolating occupation sometimes, but we are a community and we do love to help each other.

Ultimately though, I do believe that teachers need to advocate for science



as a subject, and school leaders have a key role to play too. We need to make sure that non-SATs subjects are given more curriculum space, more time and, ideally, more funding. This, in turn, helps us to build knowledge and inspire more young people.

Dave Grosvenor is the Education Programme Manager at Learning by Questions (www.lbq.org)

JUNE

ASE: Technicians Leadership programme: Day 3

06/06/2019 Hatfield, University of Hertfordshire, College Lane, Hatfield, AL10 9AA

ASE Primary Science Teachmeet

17/06/2019 Willington Road, Cople, Bedford, MK44 3TH

ASE South East Conference 2019

19/06/2019 University of Surrey, Guildford, GU2 7XH



Univ. of Surrey

ASE Teachmeet at Woolsthorpe Manor

20/06/2019 Woolsthorpe Manor House, Grantham, NG33 5PD

ASE(NI) Conference - Futureproofing Science Education

21/06/2019 St Mary's University College, Belfast, BT12 6FE

ASE National Technicians Conference South

13/06/2019 University of Hertfordshire, De Havilland Campus, Hatfield, AL10 9EU

ASE Biodiversity Site Visit

23/06/2019 Bank House, Rawcliffe Bridge, Goole, DN14 8PP

ASE Visit to the Royal Observatory and London Region ABM

29/06/2019 The Royal Observatory, Blackheath Avenue, Greenwich, London, SE10 8XJ

JULY

ASE Futures Conference 2019

04/07/2019 - 05/07/2019 Sheffield Hallam University, S1 1WB

ASE National Technicians Conference North

05/07/2019 National STEM Centre, York, YO10 5DD

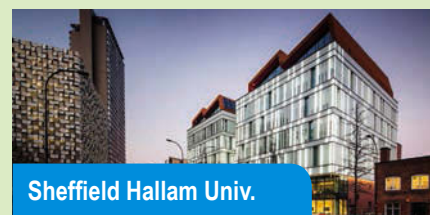
Avon Science Technicians Annual Meeting

12/07/2019 Broadlands Academy, St Francis Road, Keynsham, Bristol, BS31 2DY

COMING UP

ASE Northern Area Conference

16/11/2019 Sheffield Hallam University, S1 1WB



Sheffield Hallam Univ.

ASE Annual Conference 2020

8-11th January 2020 University of Reading, Whiteknights Campus, Reading, RG6 6UA

ASE Futures near you

ASE Futures continues the tradition of a summer conference, this year at Sheffield Hallam University on 4th and 5th July (see www.ase.org.uk/events/ase-futures-conference-2019). There is also regional activity that is strong in some areas but, to benefit all Futures members and attract new ones, we need to develop this further.

Involvement in general region activity is important; region committees need Futures members as well as classroom teachers, senior leaders and technicians. However, just as the Futures Conference has a programme tailored to our professional needs, we also need local activity addressing our specific interests. Unless Futures members are lucky enough to work in a large organisation, they may not have as many opportunities as others for professional discussions with colleagues in similar roles. ASE is certainly a remedy to address the professional isolation that can come from being the only science specialist in an organisation. As well as building the contacts that allow for informal and *ad hoc* interactions at any time, the regular Futures network meetings are a scheduled opportunity to consider science education from the perspective of those providing professional development for others.

Active regional Futures groups have different ways of organising themselves (see Boxes 1 and 2 for examples). Some have leaned towards a formal structure with local officers to organise things; others rotate responsibility for meetings. Many meetings have discussion-led agendas, but some include invited presenters or have a TeachMeet format. Futures networking meetings are now included on the ASE website, so you can easily find local networks and publicise your own meetings (see www.ase.org.uk/events).

If there is Futures activity near you that you are not already accessing, please do get involved – the more people that contribute, the better our networks become.

If you live too far from regions where there is a regular schedule of meetings, don't wait to be asked – start something yourself. The Futures Committee is happy to support you, as is your Field Officer. However, ASE works best when lots of us are involved in making things happen: #WearetheASE. So:

- Use your ASE contacts and any other networks to get a core group interested in meeting;
- Decide on a date and time and find a venue – somewhere free if possible, e.g. a school, university, science organisation, the back room of a pub;
- Put together an agenda to suit your target audience;

Box 1: North West ASE Futures

North West ASE Futures is an active group of about 30 members that meets once per term.

MMU STEM Education Centre is very supportive of the group and provides a free meeting room, light refreshments and free parking. Meetings usually last for about two hours and provide a great opportunity for networking. They allow attendees to share and discuss local and national issues and activities that affect and influence their work. Recent discussion items have included the Ofsted framework consultation, outcomes from GCSE2018 and how accountability measures are affecting primary science provision in the region.

Detailed meeting notes are sent out so that members unable to attend are kept up-to-date.

- Send details of the meeting and agenda to the Futures Committee Secretary, Pete Robinson at support@peterobinson.org.uk or Frances Evans at francesevans@ase.org.uk. They will upload it onto the Eventbrite and ASE websites and notification will be sent to members in your region;
- Alert contacts using e-mail/social media;
- Enjoy your meeting – don't forget refreshments; and
- Repeat each term.

Box 2: The London Primary Futures Network

This is now a network with a contacts list of 15 -20 people. From a group of mainly LA primary advisory teachers, it has diversified to include SLEs, independent consultants, PSTT fellows and school-based specialists. Our current 'home' is the Linnean Society of London, which generously provides us with a free meeting room and refreshments.

Meetings (held from 4:30-6:00, once per term) are organised on an informal rota system, with someone volunteering at each meeting to organise the next one, but everyone is encouraged to suggest and lead agenda items or invite visitors. Typical agenda items include presentations by organisations supporting primary science and offering resources, workshops and CPD to London schools, updates on local and national issues, sharing of ideas and resources, and new initiatives. The Pan London Assessment Network, responsible for the ASE PLAN resources, arose as an offshoot from this group. As well as being a professional forum where we can bounce ideas and keep up to date, the group provides a useful source of information to share with the schools we support.

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The PREP ROOM

Compiled by Sue Smith

As I write this, it is the end of the spring term and it's been busy, to say the least.

The ASE Laboratory Technicians Committee met earlier in the term at Hatfield and continued our discussions about the summer conferences.

For those of you who have been to the Technicians' Conference over a number of years, you will have experienced the increasing expansion of the event. When the Conference expanded to two days, this opened up not only the ability to choose more sessions, but also to enjoy the networking side of the event by socialising in the evenings. We were lucky enough to enjoy Sue Smith's organisation of a meal out and also Simon Quinnell's fascinating 'Walks of York.' It was a chance to meet up with old friends and make new ones.

When Simon moved on from the National STEM Centre at York (our conference venue), we lost our easy access and organiser but, as all good technicians do, the Committee were quick to find alternative arrangements.

We had been privileged to receive Enthuse Awards, which offset the cost of the course, and so the Conference was free to attend. This was not to be in 2019. The STEM Centre is a great venue, but this is reflected in the cost. We needed a Plan B!

ASE runs conferences for technicians in various venues and a new(ish) one in Hatfield was popular because it

was easy to get to and the venue cost was realistic.

After brainstorming with Shaun Reason, CEO of ASE, we formulated a Plan B and we have Shaun to thank for the negotiation with the STEM Centre to get the best pricing structure he could.

Plan B – a one-day national conference in two venues!

ASE National Technicians Conference South
University of Hertfordshire
De Havilland Campus, Hatfield
13th June 2019

and

ASE National Technicians Conference North
National STEM Centre, York
5th July 2019

This idea would meet many of the requirements asked for by technicians, while keeping the spirit of the two days at York that were so loved:

- A national conference but a *local venue*;
- A conference that didn't necessarily need an overnight stay – *cost-saving/more accessible for tight budgets*;
- An arrangement that would allow technicians to choose the venue closest to them – *saving travel time*; and
- Keeping the 'By Technicians for Technicians' ethos, which we have found to be the *most liked sessions*.

In both venues, there is accommodation locally, so it would still be possible for technicians to stay overnight if they choose to, and I'm sure some will.

More recently, we have been speaking to those technicians who love to present and who you tell us give great presentations. Following feedback from the previous conference and surveys carried out, we chose subjects that you have asked for. There are several sessions this year about how to run or improve your technical service. I think that the programmes in both North and South represent what most technicians need.

We have had fantastic help from ASE office staff, Frances and Angela, in getting the event sessions set up and put onto Eventbrite. If you've not used Eventbrite before, it's an easy way to book to attend just about any event that is happening. You are able to choose your sessions and book a ticket yourself, and you are able to request an invoice.

The Committee has been able to review the national conference and decide what might need to change to improve it for the future. The 'Do-Review-Do' process is key to all the CPD that we do and it neatly brings me to how and why to choose sessions at conference. It is very easy to choose sessions on topics in which we feel capable. They don't challenge us. We feel comfortable. We take nothing away



from that session. We should be looking at ourselves and asking 'what do I need to do to improve?' A self-review or a more formal school review often poses the question 'where do you see yourself next year – what do you need to do to get there?' Before you book your sessions, do you review yourself and choose sessions that will improve your skills or supply skills that your school needs you to have? Are you making best use of the precious time

at conference? Do you create a mini follow-up programme for a month/term/year to see if you are improving? Do you 'Do-review-do'?

Take a closer look at the sessions: choose something that you will need now or in the future. Use the skills that you've gained to present to fellow technicians or teachers (but please credit the person who ran the session!). This adds value to what you do and

makes excellent use of the time and money spent on conference, something that will help you get that 'Yes' when you ask to attend.

The Committee members are just like you, technicians in a school, and they face the same difficulties in getting time away from the day job. We will be at conference, so please do come and say hello, enjoy the day and take plenty away.

Who's who on the Lab Technicians Committee

In the February issue of EIS, we introduced most of the Committee members to you. Here are the remaining members!

Liz Shaw RSciTech

(E-mail: shawer@hotmail.co.uk)

I studied forensic science at university before going on to work in a food microbiology lab for a couple of years. A move from rural Derbyshire to Liverpool necessitated a change of career and I found myself working as a school lab technician for the first time. I have mainly done biology with a year of A-level physics thrown in – not my strong point at all. I have worked in two different schools now, both of which had a sixth form, so I have done quite a lot of A-level biology. My first Head of Department insisted on doing a lot of extra microbiology, which built on the skills I had learnt in the lab. As a result, I am now very confident in leading my teachers in doing microbiology practicals and giving them advice. One of the things I enjoy most at my current school is running two clubs with the Head of Biology. We have gardening and physiology clubs every week. This is the second year of doing both, so I have learnt a lot about dissecting various different specimens; the highlight for me and many of the pupils was dissecting a pregnant dogfish with five smaller fish in its intestines.

I have been on the ASE Technicians Committee for a little over 4 years and I find it challenging and rewarding. The highlight of the year is the annual Technicians Conference. The committee works tirelessly behind the scenes, making sure that everything happens at the right place and time. It is hugely enjoyable to meet everyone and reconnect with technicians. It is so important to encourage each other and that is one thing upon which the Committee is firm. We take time to review each and every RSciTech application we receive and it is fantastic to see so many people gaining this registered status. We are currently working on updating one of the documents that we provide to members and hope that it will become a feature of prep rooms all over the country.

Jane Oldham

(E-mail: janeoldham@talktalk.net)

Recently co-opted onto the ASE Laboratory Technicians Committee, I am looking forward to supporting my fellow technicians and giving something back to the profession.

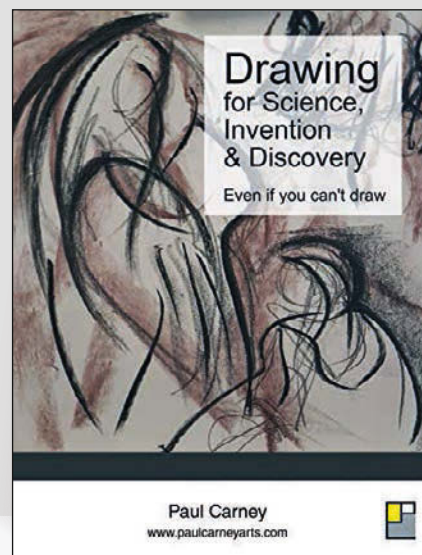
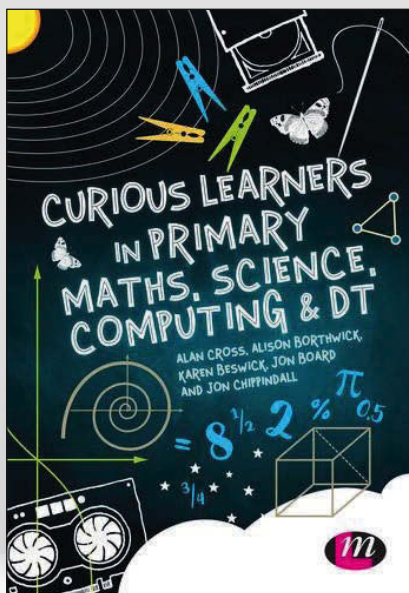
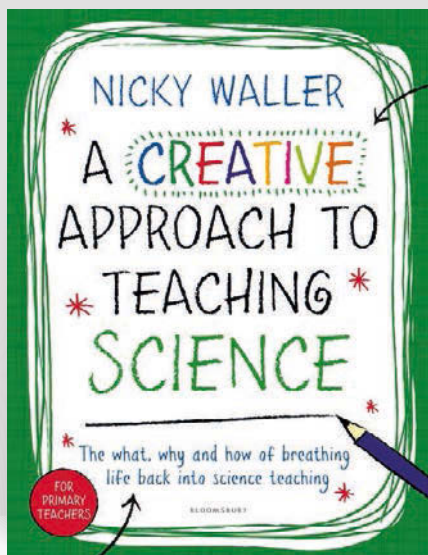
As Lead Science Technician I am currently a chemistry specialist for Key Stages 4 and 5 (ages 14-19). I have seen several changes in the curriculum and have been privileged to

work with experienced and enthusiastic colleagues, thus developing a wide-ranging knowledge of chemistry practicals and demonstrations. In my chemistry role, I give advice to colleagues, suggesting suitable new experiments to fit schemes of work and I also support in the classroom, delivering demonstrations. As well as specialising in chemistry, I have experience of covering both biology and physics at Key Stages 4/5 and Key Stage 3 (ages 11-14) and supporting extra-curricular science activities.

I lead a team of 6 across three sites in a large 11-18 Academy and also act as the Health and Safety Officer for the faculty. As part of the H&S role, I induct all new staff in the faculty and run training sessions for technicians, teachers and students.

Before becoming a school science technician, I worked for over 20 years for a large fibre and chemical manufacturer, starting as a technician and ending as a dyeing and finishing specialist, developing new products, and had some responsibility for health and safety matters.

Please e-mail comments to our Prep Room Editor: **Sue Smith RSciTech**
mullineux@hotmail.com
Twitter: @susanmullineux
Use hashtag #asetech



A Creative Approach to Teaching Science

By Nicky Waller

Ages 5-11 years

£12.74 (ASE member price)

A Creative Approach to Teaching Science is filled with exciting and innovative ways to teach and meet the objectives for primary physics, chemistry and biology from Years 1-6.

Each idea has been tried and tested, used in the classroom with children of the relevant age range, and all are deep rooted in practical enquiry with clear links to the statutory requirements for primary science.

This book is jam-packed full of strategies and ready-made ideas with a creative edge, aimed at engaging children and encouraging them to think critically and scientifically, and to consider key scientific topics in real life scenarios.

This book is a must-have for teachers looking to inspire their pupils, and making sure they have fun along the way.

Curious Learners in Primary Maths, Science, Computing & DT

By Alan Cross, Alison Borthwick, Karen Beswick, Jon Board and Jon Chippindall

Ages 5-11 years

£20.39 (ASE member price)

Whether it is in the National Curriculum or the Teachers' Standards, promotion of children's curiosity is highlighted as a key part of effective teaching. Curiosity has the potential to enhance learning in all curriculum subjects, but it has a special connection with scientific thinking. A curious approach can open up learning in science, computing, design technology and mathematics. This text explores how teachers can harness the power of curiosity in their classroom. Full of practical teaching ideas for engaging learners and making lessons more exciting, it highlights the ways in which STEM subjects can be taught together. Coverage includes:

- the place of curiosity in subject teaching
- how curiosity contributes to a learner's overall capability
- examples of curiosity in primary STEM classes
- case studies that exemplify curiosity

Drawing for Science Invention & Discovery: Even if you can't draw

By Paul Carney

Ages 14+

£8.49 (ASE member price)

This book is aimed at all the scientists and thinkers out there who understand the value of creative thinking in their field. It identifies some of the key cognitive processes that drive innovation, invention and discovery. They are compared and then illustrated, the cognitive processes behind them explained, or exercises provided so that you might improve these skills in yourself or your students.

Nine processes are discussed from both a STEM and an art perspective: observation, collaboration, knowledge, serendipity, methodical, alternative viewpoints, trial & error, adaptation and visualisation.

It is not a 'How to Draw' book, nor do you need to possess any drawing or art ability yourself in order to do the exercises. What it will do is show how the visual, semantic process of drawing is essential to our progress and a language in its own right, not a gift for the talented few.

Millgate House news

Concept Cartoons: new electronic versions available!



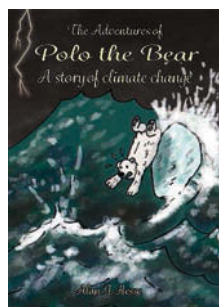
Concept Cartoons have been a 'must have' resource for teachers for many years, with both the books and CDs being firm favourites worldwide.

Millgate House Education is delighted to announce that the entire range of Concept Cartoons resources, Science Set 1, Science Set 2, Mathematics, English and Science Questions, are now available as electronic downloads.

The PDF and PowerPoint files are directly downloadable when ordered through the Millgate website and are compatible with all operating systems.

To help as many people as possible to access Concept Cartoons, we've dropped the price too! Just £30 per set! This is a one-off cost and you can distribute the files to all the teachers in your school. No postage to pay and no waiting for a delivery; you can start using them straight away!

Welcome climate change ambassadors!



The Adventures of Polo the Bear: A story of climate change. Follow Polo's new blog at <https://climatebear.com> – he loves

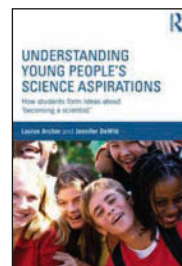
answering e-mails and messages!

Find out more about his adventures from his book, *The Adventures of Polo the Bear: a story of climate change*, £8.50 for members at www.ase.org.uk.

www.millgatehouse.co.uk

Understanding Young People's Science Aspirations

How students form ideas about science aspirations



This book offers new evidence and understanding about how young people develop their aspirations for education, learning

and, ultimately, careers in science. It also offers an explanation of how some young people do become dedicated to follow science, and what might be done to increase and broaden this population.

This key text considers how we must encourage a supply of appropriately qualified future scientists and workers in STEM industries. It is a crucial read for all training and practicing science teachers, education researchers and academics, as well as anyone invested in the desire to help fulfil young people's science aspirations.

Available from www.ase.org.uk

Interested in publishing? We can help!

Are you interested in writing or publishing and wonder how something gets from a bright idea to a useful publication? If so, we are looking for volunteers to join us on the ASE Publications Specialist Group. You don't need to be an experienced writer, reviewer or have published anything yourself – we are happy to help, train and give you experience of the whole process of assessing and producing high quality publications, from start to finish.

As the new Chair of the Publications Specialist Group, I am looking to expand our remit and influence across science education at all levels, from early years to post-16. ASE has a reputation for producing high quality materials that are an indispensable part

of every teacher's professional life. Our group needs input from a diverse range of specialists and generalists.

As well as producing our own books and materials, we also review and stock work from other publishers – yes, folks, 'free books!' are a perk of being a group member. ASE also runs a book award that is highly competitive, with a number of well-known authors and publishers entering books each year in the hope of gaining a prize, or the ultimate accolade of ASE Book of the Year.

The work of the group is a core activity of ASE, which prides itself on being a professional association run by members, for the benefit of members. As a new science teacher, I first sat on the then 'Publications Committee' in the 1980s. It was, for

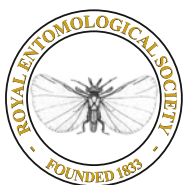
me, the start of a career in writing that has resulted in a number of books, textbooks and articles. When I started, I'd been encouraged to volunteer for Publications by my university tutor. Thirty years later, I'd like to invite you to make a similar journey or, if you are an experienced writer or reviewer, to consider helping us deliver a great service for our members. More details about the group, its work and meetings can be found here: www.ase.org.uk/content/committees or, if you'd like an informal chat before deciding, contact me by e-mail: James.Williams@sussex.ac.uk

James Williams
Chair of the ASE
Publications Specialist
Group



Photo credit: Paul S. Jenkins (CC) BY-NC-SA
www.pictacule.co.uk

The 2019 Great Bug Hunt Competition for Primary Schools



Show us what lurks within the habitats in your school grounds...

... Your school playing field, the hedges, flowerbeds, trees and long grass, under logs or stones or underground – an adventure in the offing! Encourage pupils to get outside to learn more about living things and their habitats and to use the outdoor classroom.

Whichever year group you teach, to delve into the exciting world of bug hunting and watch the excitement, the enthusiasm building, the inspiration mounting and the subsequent learning flood from your pupils is a truly thrilling experience.

Simply identify a local habitat, get the pupils to explore and discover the minibeasts (bugs) that live there, draw them and record their findings – it's that easy!

So, get involved in the biggest bug hunt you've ever done and enter for a



Bug Hunt entry from 2018.

chance to win a fabulous Bug Day in your school!

Visit www.ase.org.uk/resources/great-bug-hunt-2019 for full details.

ASE Green Tick Evaluation Scheme www.ase.org.uk/greentick

The latest Green Tick evaluation summaries:

Farming STEMterprise

This free scheme will be available to download from the new NFU Education website from April 2019.

This resource uses the context of farming and the production of food products to develop pupils' learning within the areas of STEM and business education. The wide range of classroom activities and supporting materials supports learning across almost the whole curriculum, with the key areas of numeracy and literacy effectively integrated into the core STEM and business-focused activities.

Across each of the three series of lessons, pupils learn about and engage with the growing of vegetables, herbs and fruit for the purpose of preparing food products that are then sold within their business model. Throughout the programme, pupils are required to work within their teams to make decisions and solve problems. The materials throughout are attractive and thoughtfully produced, include some excellent video clips, and make use of active assessment strategies to

maximise pupil involvement in learning. The resource also includes a good range of investigations, which could sit alongside schools' current enquiry-based science programmes.

The resource could be adopted for a scheme of work over a number of weeks or, alternatively, given the wide range of content and activities, teachers could incorporate specific lessons and activities into their existing teaching programmes. Either way, pupils and their teachers will be the winners.

Kognity Intelligent Textbooks

www.kognity.com

These Kognity 'intelligent textbooks' are designed for AQA GCSE Biology, Chemistry, Physics and Combined Science (Trilogy).

What sets the Kognity resource apart from printed textbooks is the interactive content sprinkled throughout its sections, including animations and videos. In addition, there are exam-style questions with mark schemes and a facility for the teacher to send differentiated assignments to students by selecting from the resource.

Whether students use it independently or as directed by the teacher, Kognity is a valuable tool and one that can make teaching and learning more efficient

– no small bonus when many schools complain of insufficient time for teaching science.



Students can study topics in any order and are supported by checklists, worked examples and skill boxes giving general hints and covering working scientifically, maths skills, required practicals and exam tips. Students also get plenty of practice with typical GCSE problems and can see how well they have grasped each topic by answering questions (set and marked online) at the end of each section. The Kognity resource certainly goes well beyond just learning content.

Whilst not replacing great teaching, Kognity is a highly versatile resource worthy of very serious consideration to support learning, progress and achievement. It helps to facilitate a lot of the nitty-gritty learning and practice that students need. Time is freed up for a broader range of practical work, skill development and working with the content in a wide range of contexts, so that students experience science far beyond just passing the exam, developing a lifelong interest in the subject and hopefully being inspired to pursue further study and careers in science.



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A series of popular one day events held at Universities and Colleges for 11 -14 year olds.



2019

69 **Salters' Festivals of Chemistry** will take place at 53 Universities and Colleges throughout the UK and Ireland.



Places may still be available for Festivals in the Summer Term!

Students will experience...

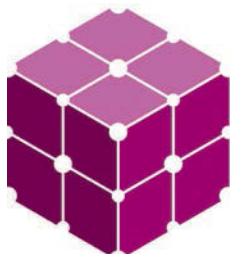
Exciting hands-on practical Chemistry challenges
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festivals@salters.co.uk



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in collaboration with



Salters' National Awards for Science Technicians

In collaboration with **CLEAPSS** and **SSERC**, the Awards highlight and recognise the important work of school and college science technicians.



Up to **four awards** of **£1,000** each are made annually



The Awards are open to **ALL** science technician teams (sole technicians are also eligible!) in schools and colleges across the UK.



The closing date for 2019 has now passed. We would like to **thank all the technician teams** who have applied.



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www.saltersinstitute.co.uk

LOOKING FOR YOUR NEXT TEACHING ROLE? THEN LOOK NO FURTHER

SUBJECT LEADER FOR SCIENCE ASHCROFT HIGH SCHOOL

Bedfordshire, MPS/UPS + TLR £7,852

Ashcroft High School is an 11-16 mixed comprehensive school, judged to be 'Good' with outstanding leadership and management by Ofsted in January 2018. With a wide range of ethnic, cultural and social backgrounds, this diversity creates an interesting range of exciting opportunities and educational challenges. It is looking for an outstanding subject leader for science to start September 2019, who has a track record of raising attainment and delivering outstanding lessons. Science is a popular and successful subject at Ashcroft High School and you will join a friendly and supportive department.

Contact Brett Coventry on 020 3818 7041,
email ashcroft@hays.com or visit
hays.co.uk/jobs/ashcroft-high-school

TEACHER OF SCIENCE ST THOMAS MORE CATHOLIC SCHOOL

Willenhall, MPS/UPS + TLR negotiable

Proudly rated a 'Good' school by Ofsted in 2016, St Thomas More Catholic School is committed to high standards of growth and professional development. The school is popular and well respected in the local community. It is looking for an outstanding teacher of science. You will be joining an experienced group of qualified practitioners who very much work as a team. Science is enjoyed by students across all year groups and is a popular choice at A-level. In return, you will be a part of a welcoming and inclusive environment, with a culture of openness and transparency. Teachers flourish at St Thomas More and fantastic career advancement for teachers at all levels is offered.

Contact Paul Hunt on 0121 236 4476,
email paul.hunt@hays.com or visit
hays.co.uk/jobs/st-thomas-more

This is just a selection of the opportunities that we currently have to offer. To contact one of our recruitment experts, email us at permanent.education@hays.com

TEACHER OF SCIENCE MULTIPLE SCHOOLS

Isle of Man, MPS/UPS

The Isle of Man offers a unique and vibrant setting to progress your career as a teacher of science. All five secondary schools offer the possibility to teach up to KS5 in inclusive settings and beautiful surroundings. Progression is quick and each school offers a supportive environment where teachers are highly regarded. In return, you will receive a lower rate of income tax, an excellent induction programme and CPD.

Contact Hannah Connell on 0151 242 5100
email hannah.connell@hays.com
or visit hays.co.uk/jobs/teach-isle-of-man

SECOND IN SCIENCE ST MICHAEL'S CATHOLIC SCHOOL

Buckinghamshire, MPS/UPS + TLR 2b

St. Michael's Catholic School is a very popular school with a through-school campus in High Wycombe, and a new secondary campus in Aylesbury, which opened in September 2018. The High Wycombe campus is unique in being the only through-school in Buckinghamshire, providing excellent educational opportunities for children from 3-19. It is looking for an inspiration teacher of science for the Wycombe campus. It is particularly interested in applications from chemists and physicists as this would support in strengthening its A-Level provision. In return, you will be part of a community that is dedicated to achieving the best for pupils. St Michael's is committed to providing the highest standards of education from nursery through to sixth form.

Contact Richard Lanning on 01273 729465,
email richard.lanning@hays.com
or visit hays.co.uk/jobs/michael

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