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**10TH
EDITION**

**PRIMARY
SCIENCE**

KNOWLEDGE & UNDERSTANDING

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LM Learning
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FOREWORD

Dear Teacher of Science ...

This foreword is an opportunity for me to assure you that you are an extremely important person ... no, really! Primary teachers are important anyway – you are teaching our kids the essential knowledge and skills that they need to be able to progress in their schooling; however, in primary schools, with so much emphasis on English and maths, it's often hard to appreciate how valuable your teaching of the Science, Technology, Engineering and Maths (STEM) can be. Some might teach science because they have to, rather than because they want to, but it can be a fabulous journey of discovery for them and their students as together they learn about how the universe around them functions. Design and technology is part of the curriculum and can be a complementary subject to science and maths. It can also be a hugely creative subject with different styles of learning that appeal to many children. Engineering may not be a curriculum subject, but we live in an engineered world and it can provide context to your teaching. Additionally we have computing, which not only helps students function in an increasingly digital environment, but the disciplines and tools of the computing curriculum can be applied across the curriculum, including science.

So what? You have the opportunity to have a significant positive impact on the lives of the young people you teach through the work that you do as a science teacher. You are in an excellent position to inspire them not only with regard to subject choices but also possible careers – challenging stereotypes and false perceptions that are often reinforced by families and friends, the media and, sometimes, poor teaching. Many young people's views of scientists and other STEM professionals are very stereotypical and increasingly at odds with the reality of the situation. Ask them to draw a scientist and they draw someone who looks like Einstein wearing a lab coat and holding a test tube; ask them to draw an engineer and its hard hats, spanners and overalls. Few of them realise that every sector of the economy and many diverse jobs need people who are numerate and skilled in science and technology. Stereotypes, particularly gender stereotypes, are extremely prevalent, reinforced by unconscious bias in the language used and the attitudes expressed. We see the outcomes of this in the poor numbers of girls studying physics beyond GCSE¹ and the appalling numbers of women taking degrees and apprenticeships in engineering ... with less than 10 per cent of engineers in engineering companies in the United Kingdom being women² we are one of the worst performing countries for women in engineering in Europe.³

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1. Girls in the Physics Classroom: A review of the research on girls' participation in physics. A literature review of the research from 1990 to 2005, Institute of Physics.
 2. Engineering UK 2017 Report, Engineering UK.
 3. Women in engineering: Fixing the talent pipeline, IPPR 2014.

The children you are teaching now might not be deciding on their subject options for a few years yet, but research from King's College London⁴ has shown that children develop fixed views on whether or not they are likely to follow science or arts subject choices by the age of ten. Many enjoy science, consider it important and see scientists as doing great things, but few (15 per cent) see it as a career path for them. However, this is not just a matter of equality or the broadening of aspirations – there is an economic need. The economy in the United Kingdom and across the globe needs more people with the right STEM qualifications and the right skills sets. Globally STEM-based jobs are the most in demand. There are massive shortages in the availability of suitably qualified candidates for jobs that need science, maths, engineering and computing skills. Science-based careers such as medicine and engineering are some of the best remunerated, but are also those that can make the biggest difference. Science and technology careers are hugely creative – a scientist with a good imagination develops theories that need to be tested experimentally, perhaps using equipment that still needs to be developed; engineers and designers are problem-solvers and creative thinkers who create or improve the products we use, solve local or global challenges and develop new and innovative means of production. Ideally, a student wouldn't concentrate solely on STEM subjects or arts and humanities, but would supplement one with a little of the other to build understanding, to enable intelligent opinion and to bring other ways of thinking to bear on their main area of interest. Who knows? Your class might contain a fledgling scientist, engineer or technologist who might transform the world. If you inspire young people to pursue science and other STEM subjects they are getting a fabulous start.

It's not just about the qualifications. Employers are looking for recruits who have a range of practical and employability skills. Practical skills including design, recording, evaluation and experimental skills; and, the employability skills such as presentation, problem-solving, resilience, budget management and team working can be learnt while studying science and engaging in extracurricular challenges. For these there is a huge choice, from after school STEM clubs like Young Engineers, to badge schemes such as the British Science Association's CREST scheme, to national and international competitions such as *FIRST*[®] LEGO[®] League, F1 In Schools and Greenpower.

If all this seems a little daunting, the great thing about science is that there is huge range of support. For example, the STEM Learning Ltd provides CPD, the National STEM e-Library and the STEM Ambassador programme; the Association of Science Education (ASE) provides training, journals and networking; the Primary Science Teaching Trust (PSTT) provides training, resources, awards and accreditation. At the time of writing the Wellcome Trust is leading a national programme of resource development for primary teaching called *Explorify*, at the same time as the BBC is running its primary science campaign *Terrific Scientific*, which included teaching resources and mass, national experiments. Use this support as much as you can. Many of the resources are free and there are bursaries to support the cost of training.

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4. ASPIRES Young People's Science & Career Aspirations, ages 10–14, King's College London 2013.