

# CALL FOR INDUSTRY AND POLICY MAKERS:

## 'SWITCHING ON' TO STEM - INCREASING THE TALENT POOL OF SCIENTISTS AND ENGINEERS

### SKILLS SHORTAGES

Science and engineering are crucial to life in the 21<sup>st</sup> century, and key to solving many of the world's major challenges. However, there is a shortage of scientists and engineers across the European Union, with 43% of manufacturing employers reporting difficulties in recruiting an appropriately skilled workforce<sup>1</sup>. Industry stakeholders across Europe are concerned by the lack of interest shown by school children and young graduates in STEM (Science, Technology, Engineering and Mathematics) and related careers<sup>2</sup>. In the UK alone, engineering employers need to recruit 182,000 workers a year with engineering skills at apprentice and graduate level until 2020 and beyond.

Currently, 26,000 people are entering engineering occupations, and therefore the shortfall is of great concern<sup>3</sup>.

Increasingly, European Union countries are realising the importance of focusing on the pipeline of scientists and engineers; schools, colleges and universities. What can be done to reverse the trend and attract more young people in to the manufacturing sector, and related science and engineering careers? For many years, efforts have been made in STEM education to attract graduates and school leavers to become industrial scientists and engineers, but research is now showing that interventions at this age are too

late. Children as young as 10 years old are 'switching off' from science and engineering careers<sup>4</sup>. The long term impact of this will be the inability of European Union employers to fill crucial vacancies in 5-10 years' time.

In the UK, The Confederation of British Industry recognises this early 'switch-off' from science, and has called for greater support from businesses to ensure primary school science is inspirational and children are aspirational<sup>5</sup>. Individual sectors, such as the chemical sector, are also creating their own strategies to overcome these issues<sup>6</sup>.

### WHAT CAN BE DONE?

There are many initiatives in place to tackle the 'switch off' from science, and companies need to carefully decide which ones to engage with, both financially and in terms of the time involved. To decide, a company should ensure that they understand how the benefits and impact of any initiative

align with and support the company's goals. Sponsoring a school's football team may help to improve the local image of that company with the children and parents involved, but will make little difference to the children's career choices. A carefully chosen STEM initiative will do both.

**Companies must turn to initiatives that measure impact, firstly in terms of children's perceptions of STEM subjects and secondly, knowledge of and aspirations towards the STEM industries. The following initiatives do just that.**

<sup>1</sup> Reyman Dafne et al (2015), LABOUR MARKET SHORTAGES IN THE EUROPEAN UNION, DIRECTORATE GENERAL FOR INTERNAL POLICIES

<sup>2</sup> Durando M., European Schoolnet, *Motivation criteria leading students to opt for science studies and jobs - STEM* | Module 1 | Increasing students' engagement to study STEM | EUN Academy, 2014 [www.youtube.com/watch?v=vtA7SjUu3IA](http://www.youtube.com/watch?v=vtA7SjUu3IA)

<sup>3</sup> Reiss, MJ et al (2015) The State of Engineering, Engineering UK

<sup>4</sup> Archer, L et al (2013), ASPIRES: Young People's Science and Career Aspirations age 10-14. Porter C & Parvin, J (2010) Learning to Love Science: Harnessing children's scientific imagination

<sup>5</sup> Confederation of British Industry (2015) Tomorrow's World: Inspiring Primary Scientists

<sup>6</sup> Chemical Growth Partnership (2013) Strategy for delivering chemistry-fuelled growth of the UK economy

Children test and learn about wind turbine power whilst testing the efficiency and aerodynamics of their mini-turbine-blade cut-outs.



**inGenious and  
STEM Alliance**

([www.ingenious-science.eu](http://www.ingenious-science.eu))

**inGenious** was a successful 3 year pan-European initiative, concluded in 2014 and the STEM Alliance is the initiative building upon this network and best practices, to be launched in the Autumn 2015.

**inGenious** became a successful European platform that brought schools and industry stakeholders together and created opportunities for networking, professional learning, understanding of each other's needs, sharing of good practice and facilitation of school-industry collaboration.

The initiative involved 545 teachers, and classroom activities took place in 350 schools across 26 countries in the European Union. Two of the key findings were (i) interest and enjoyment of STEM subjects are necessary pre-conditions for STEM career motivation of students, learning of STEM careers and real-life applications of knowledge are crucial for raising student aspirations towards STEM careers, and (ii) long term external support from industry and business in order to provide high quality learning of STEM subjects and careers schools.



**XperiLAB.be®**

([www.xperilab.be](http://www.xperilab.be)) is an example of a project that improves children's perceptions of science. In 2014, the European Petrochemical Association (EPCA) invited 10-14 year old school children to climb aboard the Belgian XperiLAB.be® truck during its 2014 annual conference in Vienna. They took this opportunity to collect data on the impact of the hands-on experiments on the children's perceptions of science and related careers. After taking part in the experiments, 61% felt that science was 'for me' compared

with only 45% beforehand. Allowing children to take responsibility to explore hands-on practical experiments in small groups, independently of the teacher has a high level of impact on children's perceptions.

However, the most noticeable impact was on the career aspirations, which shifted from the desire to become an actor, footballer, vet or hairdresser, to wishing to become a scientist; often specifically a biologist, chemist or physicist. The increase in 'scientist' career aspiration rose from less than 10% to almost 40%.



The **STEM Alliance** intends to consolidate and expand the work of inGenious, by bringing together further key stakeholders from industry and education in order to i.) Promote the attractiveness and importance of STEM jobs in all industrial sectors, ii.) improve and promote all existing industry-education STEM initiatives supported by industry; iii.) contribute to innovation in STEM teaching, iv.) support the competitiveness of companies by ensuring a STEM-skilled workforce and v.) enhance industry-education collaboration at national level across all EU member states.



**Children Challenging  
Industry**

([www.cciproject.org](http://www.cciproject.org)) is a UK-based project that has had high levels of impact on children's career aspirations and perceptions of science, since 1996. This programme offers primary teachers training to help them teach curriculum science, whilst engaging 9-11 year old children in practical classroom science set within real-life industrial applications. The children then

visit industry, often the chemical, oil or pharmaceutical industries. Each visit is tailored to demonstrate examples of the science they have carried out in school.

In-depth data have been collected and analysed over a 20 year period. The impact is on children's love of science and on those wishing to become scientists. Over 90% enjoy learning about industry through the classroom challenges,

with a third of pupils maintaining this aspiration 5 years after participating in the programme. Longer term anecdotal evidence is now emerging, as previous participants approach companies for work experience and apprenticeships, and choose to study sciences at university. In addition, companies recognise the benefit to employees' personal development as a result of being involved in the programme.



## Sharing Industry's Science Stories

([www.ciec.org.uk/resources](http://www.ciec.org.uk/resources))

The Centre for Industry Education Collaboration creates resources designed to express a company's research and production via school science activities. These resources are piloted, evaluated, edited and then made freely available for all on the CIEC website. A good example of this can be found at [www.scienceofhealthyskin.org.uk](http://www.scienceofhealthyskin.org.uk). Industrial applications, or 'stories', focus on the extraction of lanolin, the production of active ingredients in sunscreen, and the importance of foam in personal care products. Via interactive starting points, the children carry out practical inquiry, and meet virtually; scientists, engineers and other industry professionals.

*Lockwood Primary School children visit Wilton International in the North East of England. In an area of high unemployment, it is proving important to raise aspirations.*



Company ambassadors then further enhance the stories, where possible, by visiting primary schools close to their sites.

The impact of using these resources in school is such that both teachers and children improve their knowledge of industry whilst becoming more motivated to teach and learn science.

## CALL FOR YOUR SUPPORT

If your company is not already involved in STEM initiatives, you have several to choose from here. If you are already carrying out such activities, ensure that the programmes you support **do** have a **measurable** impact on school children's STEM careers aspirations, and that they have **three-way links**. Only

through interlinking these elements in a programme, can pupils make sense of the pieces of the jigsaw they are often offered one at a time.

**Support initiatives** that result in excellent teaching and learning in science, demonstrate industry applications

through 'bringing science to life', and help pupils understand the relevance of a wide range of careers to these applications, in order to see **informed school-leavers with aspirations to study STEM subjects and pursue a career in STEM industries**.



Excellence in science teaching and learning



Increased awareness of STEM **careers** (by teachers and pupils)

Increased awareness of STEM **industries** (by teachers and pupils)

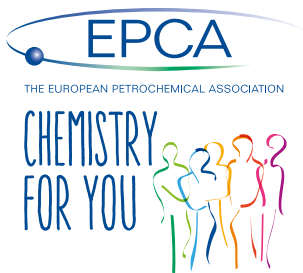
## HOW MUCH WILL IT COST?

When considering the implications in terms of in-kind and financial support, weigh up the impact of short and long term options, in terms of the desired

outcomes. Industry needs to support educators in inspiring the next generation to not only study STEM subjects beyond the compulsory age, but to

ensure pupils aspire to a STEM career in your sector. The cost of not doing so could be far greater.

*Written by Joy Parvin, Director, Centre for Industry Education Collaboration, Department of Chemistry, University of York (UK)*



### ABOUT EPCA

Based in Brussels, EPCA is the **quality network** in Europe for the **global chemical business community** consisting of chemical producers, their suppliers, customers and service providers. It operates for and through more than 700 member companies from 54 different countries. EPCA provides a platform to **meet, exchange information and transfer learning**, and serves as a think tank for its members and stakeholders. EPCA promotes STEM education, with a clear focus on gender and diversity inclusion. EPCA also underscores that the chemical industry is a good industry to work for.

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### ABOUT CIEC

The Centre for Industry Education Collaboration is based in the University of York, UK, and is a not-for-profit organisation aimed at supporting local, national and international school-industry partnerships. CIEC create, deliver and evaluate resources and programmes which inspire young people to study science beyond school-leaving age and aspire to careers in STEM industries.

**Homepage:** [www.ciec.org.uk](http://www.ciec.org.uk)

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### ABOUT EUROPEAN SCHOOLNET

European Schoolnet is a network of 31 European Ministries of Education, based in Brussels, Belgium. As a not-for-profit organisation, we aim to bring innovation in teaching and learning to our key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners.

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