**Submission to Enterprise and Learning Committee Inquiry into STEM skills**

Sustaining and developing knowledge and skills in the engineering sector is right at the heart of the renewal of Wales' manufacturing base and the harnessing of new research and development, particularly in potential growth areas such as renewable technology, as highlighted by the One Wales report. Now is the time for a renaissance in Welsh engineering excellence, a time for young people in Wales to be switched on to this exciting and rewarding career path, so that they can be at the heart of Wales' success story.

Primary research by EngineeringUK has shown that 53% of people in Wales think that engineers are likely to get the country back on track. However separate research has shown that when asked what engineering development has had the greatest impact on their lives 63% said either no engineering development has had an impact or couldn't name one. This is why we must be smarter about communicating engineering's value and role in Wales.

We have set down below some areas that we hope your inquiry can explore in terms of the issues and challenges currently faced by the engineering and wider STEM sectors in Wales.

Our main point is that AMs and ministerial teams in Wales must understand that investing in and building a robust skills base in engineering and wider STEM skills, starting at an early age (well before 16) will be hugely beneficial to the economy. All too often this subject is overlooked, by careers advisers, by teachers and by students. We are working to show how dynamic and exciting a career in engineering can be. But we need your help to do this.

**Inquiry issues**

**1. Adequacy of provision of science, technology, engineering and mathematics skills in schools, FE colleges, HE and work-based learning.**

We believe that often the 'E' in STEM is silent. Engineering is the only STEM subject not routinely taught as part of the curriculum. So it is crucial that engineering is linked to other STEM subjects by teachers and advisers, and that the wider engineering community is able to forge links back into the classroom and to schoolchildren. The development of an engineering 'principal learning' stand in the Welsh Baccalaureate is welcomed.

Career paths in and into engineering are poorly understood by both students and their career advisers - 40% of advisers wrongly believe that A-levels and degrees are the only route to an engineering career[1]. There needs to be much clearer signposting of the routes into engineering.

STEM subjects, students and teachers can be overwhelmed by the current plethora of initiatives. We support co-ordinated programmes that bring together multiple initiatives and organisations. Our programmes - The Big Bang and Tomorrow's Engineers - are targeted where need is greatest and evaluated so we can assess their impact.

[1] An Informed Choice: A Roadmap for Increasing Careers Information, Advice and Guidance Throughout The UK, EngineeringUK 2009

Despite numerous initiatives encouraging young people to study STEM subjects and pursue STEM careers, young people remain the demographic group with the least positive perceptions of these subjects. Only 18% of 11-16 year olds perceive engineering as a desirable career. There are however, some signs of progress, particularly in 16-24 year olds, whose perceptions of engineering have increased by 5% in the past year[2].

Despite the multiplicity of STEM initiatives in place, there is a risk of these being inappropriately targeted or insufficiently evaluated. Currently, only 35% of the public and only 30% of 11-16s had seen, heard of, or visited something in the past year that presented engineering in a positive way and inspired them[3].

## 2. The supply of educational professionals able to teach STEM subjects

The teaching of STEM subjects requires motivated and inspirational teachers. We believe in the importance of both enhanced recruitment of STEM practitioners into teaching, and effective continuing professional development (CPD) in both subject area and teaching style.

STEM teachers also need to be more holistic in how they view the STEM subjects, which are highly interlinked. Since it is often not taught as a specific part of the academic curriculum, engineering relies either on the other STEM subjects or vocational qualifications to provide a solid foundation for careers in the sector. Extra-curricular enhancement and enrichment activities are vital in helping pupils make the link between subjects learnt in the classroom and their real-world application

There is considerable variation in both the forms of teaching and the popularity of STEM at different levels across the UK education systems. Research by EngineeringUK has shown that amongst 7-11 year olds, Art and Design is the favourite subject, with Design and Technology in third place – both are STEM subjects. Children say they prefer these subjects because they enjoy the design and building element and the opportunity to be creative[4].

In contrast, physics is the least popular subject for this age group but it is a pre-requisite for most engineering courses in higher education.

Greater emphasis needs to be placed on linking the perceived enjoyment and creativity of Design and Technology to the underlying necessity for a comprehensive understanding gained through physics[5].

An important concept, as we outlined in our response to a recent Government consultation[6], is to widen the pool of talented and knowledgeable STEM practitioners who can support STEM teaching in schools. The Welsh Assembly Government's decision to allow further education lecturers to teach in school classrooms is welcomed and we also suggest that provision be made to allow STEM practitioners from business and industry to play a role in classroom teaching, to provide students and teachers with a 'window' on the world of STEM employment.

[2] Rebuilding the UK Economy
[3] Ibid
[4] Rebuilding the UK Economy: Changing Perceptions of Engineering, EngineeringUK 2009
[5] Ibid
[6] "Updated replacement for the Education (Specified Work and Registration) (Wales) Regulations 2004", Number 085/2010

## 3. The effectiveness of education and business links between education institutions and STEM employers

Many advisers and trusted intermediaries are not familiar with the routes and qualifications needed to pursue a career in engineering. Research by EngineeringUK showed that 40% of advisers wrongly believed A-levels and a degree is the only route to an engineering career[7]. Whereas, in reality, apprenticeships and further education programme are equally important routes to producing the range of skilled professionals needed in STEM-related business and industry. A better understanding in teachers of the levels of employment in industry is needed, ideally generated through better education-business links.

It is vital that careers information and advice about careers in STEM is visible and accessible. There need to be coherent messages about STEM careers, supported by a range of institutions and organisations drawn from the whole sector rather than the existing plethora of 'competing' careers materials.

One notable area where progress has been made is in BTECs, where the first diploma makes a significant contribution towards providing young people with engineering and construction skills. The latest Edexcel figures show growth of 89% and 340% from 2006/07 in entrants to engineering and construction skills respectively. In 2009/10 the entrant numbers to BTEC Firsts were 5,879 to engineering and 4,986 to construction skills.

We have welcomed the Engineering Diploma as a pathway into the engineering profession in England. The Engineering Diploma provides a good mix of academic and vocational learning which has all the potential to appeal to a significant demographic of students and to employers who call for these mixed skills. We encourage the continued development of the 14-19 work-based learning pathways in Wales and continue to work with Semta in Wales to help achieve these.

At the FE/HE interface we would highlight the success of the Engineering Foundation Degree as an innovative model in delivering Employer led degree level vocational qualifications..

It is also important not to overlook the excellent work of enrichment and enhancement organisations in forging direct links to employers that strengthen the bond between educational establishments and business and industry. Careers Wales, for example, has run an excellent series of events over a number of years, funded by EngineeringUK through its Tomorrow's Engineers programme, to give teachers and careers advisors a hands-on appreciation of STEM industry. Organisations such as Engineering Education Scheme Wales and the professional science and engineering institutes have also developed good links to employers.

### Key facts about Engineering UK and its activities – The Big Bang and Tomorrow's Engineers

i. EngineeringUK is an independent, not-for-profit organisation which promotes the vital contribution that engineers, and engineering and technology, make to our society. We also aim to inspire people at all levels to pursue careers in engineering and technology.

**ii.** EngineeringUK leads on 'The Big Bang'; the UK's Young Scientists and Engineers Fair. Next year's Big Bang will take place at Docklands Excel in London in March 2011, and will feature the National Science and Engineering Competition. The

[7] An Informed Choice: A Roadmap for Increasing Careers Information, Advice and Guidance Throughout The UK, Engineeringuk 2009

inaugural Big Bang in 2009 set a new benchmark for STEM engagement and we expect it to be three times bigger this year with over 20,000 children attending on school days - the equivalent of more than 500 classes. The Big Bang will travel to different locations around the UK to ensure a truly national reach and our ultimate vision is that every child in the UK knows someone involved with the Fair. This year we held Big Bang Wales in July 2010, at the National Waterfront Museum, Swansea. The fair was a good mix of student competitors, student and club showcases, talks and displays. The competition winners now go on to represent Wales at the UK event in March 2011.

iii. Tomorrow's Engineers is a new initiative, conducted in partnership with The Royal Academy of Engineering. It facilitates existing STEM enrichment and enhancement organisations to work together in a co-ordinated manner, to provide schools with a cohesive programme of STEM activities, to better target their efforts where they can have most effect (e.g. disadvantage students in disengaged schools), and to thoroughly evaluate the outcomes of the activities. We are working with Careers Wales and the Engineering Education Scheme Wales to provide an effective programme across Wales in the currently academic year.

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