INTRODUCTION AND BACKGROUND

The UK science and engineering industries are a key part of the overall UK economy with an approximate turnover of £257bn. Skills shortages in STEM sectors persist even in the current recessionary period, representing a real threat to the UK's capacity for growth. Many young people do not study STEM subjects beyond GCSE; a recent Department for Education report showed that while the majority of 10-14 year-olds enjoy science, less than 17% aspire to a STEM career. Analysis of the Third International Mathematics and Science Survey (TIMSS) identified, however, that young people in England value mathematics and science education and that they understand its relevance and importance for the labour market. In the light of this apparent disparity between attitude and subject choice, this report explores how engagement in and take-up of STEM subjects can best be furthered. The headings below are those used in the full report.

POSITIVE STEPS: WHAT WORKS?

- Evidence shows that engagement with science subjects decreases from the end of primary and throughout secondary school, as children conceive of science as leading to a limited range of careers. It is therefore necessary to engage them at an early age and at key transition points. They must be aware of the wealth and breadth of career and earning opportunities which are linked to STEM subjects.

- It is necessary to focus teaching on practical activities which are set in real-world contexts and offer good quality enrichment and enhancement activities. Young people regard the best teaching of STEM to be that which makes clear links to everyday situations. They come, for example, to see the links between school science and cutting edge developments such as CERN and Hubble. There is also great value in providing half or full days of STEM enrichment activities or in offering ongoing STEM clubs.

- Schools must link teaching to careers in STEM. The research evidence shows that, where pupils have a clear understanding of the possible careers related to STEM subjects, they are more likely to continue with these subjects. It is also important for their teachers and careers advisers to have up-to-date knowledge of relevant careers. Links with industry and the public sector are therefore essential. Within the local context, STEM ambassador schemes play a vital part in providing role models, mentoring and work placements which challenge stereotypes. Wider engagement between education and employers provides young people with direct knowledge, experience and connections in particular careers, which translate into improved employment and learning outcomes.

- It is important to make clear links across and between the STEM subjects. STEM disciplines are often linked in the workplace, but this is not reflected in the disparate way in which they are taught at school. Making links between these subjects is therefore key. This can be done by mapping schemes of work to identify where teachers can make such links or by the delivery of STEM cross-curricular projects. Interdisciplinary links need to be embedded in the curriculum; this will in turn raise achievement and career aspirations in relation to STEM.
• **Support for STEM teachers** is vital and they must be offered regular opportunities to update their knowledge of a fast-moving subject field and of the careers which it offers. Professional development with a focus on practical activities and real-life examples will keep lessons at the cutting edge. The STEM teachers who build on the links with colleagues from industry to provide a coherent and stimulating vision of STEM opportunities achieve more than just exam success for their pupils.

**WHAT MORE CAN BE DONE?**

• The Private Members’ Bill on STEM which is currently before Parliament has taken account of some of the above evidence in its proposals. These include placing a duty on both primary and secondary schools to offer pupils a better understanding of careers in STEM subjects and to require governing bodies of secondary schools to include two local employers. It could, however, go further. Policymakers, schools, colleges, STEM employers, professional bodies and the research community must work together to ensure that existing successful strategies are built on and that they become more widespread across the education community.

• Revised GCSEs, which will contribute to the English Baccalaureate, will include a more academic and rigorous curriculum core, and terminal rather than modular assessment. It is essential that all pupils should be challenged and inspired by this core so that they will be motivated to continue with their studies. If the curriculum, assessment, reporting, accountability and examinations frameworks do not support practical and applied activities, more traditional and less engaging approaches will dominate as teachers prioritise their pupils' academic success.

• Research strongly suggests that careers education and guidance should be provided earlier than Years 9-11 in order to increase the take-up of STEM subjects. Schools must have access to the resources which will enable them to do this.

*The full document can be downloaded from:*
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