THE COLLAPSE OF COMPUTING EDUCATION IN SCHOOLS

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There is a serious problem with the way we are educating our young people about Computing. The majority of students leave school actively disliking what they mistakenly believe to be Computing. As a result applications to UK University Computer Science courses have collapsed by 60% since 2000, yet the demand for software professionals across the EU has grown by 33% in the same period. The value added to the EU economy directly from IT products and services is around £480b each year. Computing is a vital part of Science, Technology, Engineering and Mathematics. It is also an academic discipline in its own right, underpinned by scientific and mathematical principles. It is the silent 'C' in STEM. The UK economy is missing out because we cannot meet the urgent demand from UK companies for software professionals who have the expertise necessary to create business growth.

The problem in schools is widely acknowledged by bodies such as Ofsted, the Royal Academy of Engineering, the Council for Industry and Higher Education (CIHE), BCS The Chartered Institute for IT, the Council for Professors and Heads of Computing (CPHC), the UK Computing Research Committee (UKCRC), and e-Skills UK, among many others. Yet nothing is being done about it, and the underlying causes remain. The upcoming Curriculum Review offers an opportunity to address these challenges.

The concern is that, in too many cases, children learn only how to use office software such as word processors or spreadsheets, and miss out entirely on the excitement of learning how computers actually work. An analogy would be if classes in English consisted only of learning how to spell, but missed out how to write good prose, how to analyse literature and omitted how to articulate ideas and arguments concisely, elegantly and in a compelling way.

There is such a level of universal concern that the Royal Society has begun a study into the state of Computing in schools and its importance and implications for the economic and scientific wellbeing of the UK. This has been reported by the BBC and widely picked up in the technical press. The Royal Society has set up an Advisory Group for the study and their first meeting was held on 20 July 2010, chaired by Professor Steve Furber FRS of Manchester University and former BCS trustee. BCS, the Chartered Institute for IT, is the professional body for IT and Computing in the UK and has over 70,000 members.

ICT, Information and Communication Technology, is part of the National Curriculum and taught as a GCSE by all secondary schools. It teaches students the skills needed to use everyday software applications. Computing as a discipline is concerned with the fundamental principles that underpin computer based systems and the programming languages they can execute. It is about how computers work. The ICT syllabus contains almost nothing about Computing. The March 2009 Ofsted report into ICT GCSE 'The Importance of ICT' states "Too many of the lessons seen during the survey emphasised the development of skills in using specific software at the expense of improving students' ICT capability."

There is plenty of anecdotal evidence that suggests the ICT GCSE is sometimes used as a soft option that will help a school climb the league tables. University admission tutors in private will say the gold standard for applicants to their Computer Science degree courses is A2 level Maths. In some cases, the only A2 level subject explicitly referred to by an elite University in their entry requirements for a Computer Science Degree course is Maths. For example see Manchester University's entry requirements.

A2 level Computing is seen by many Universities as desirable for their Computer Science Degree, although not essential, if the applicant is also taking Maths or Physics. For example see Surrey University's entry requirements. The fact that A2 level Computing is not a prerequisite must, in part, be a reflection of the small numbers that take the subject compared to Maths. If large numbers of students took A2 level Computing that would enable Universities to significantly enhance their degree courses, because students would already have mastered elementary Computing concepts at school before starting at University. For that to happen the ICT curriculum would have to be radically changed in order to make A2 level Computing an appealing prospect. At the moment less than 5,000 students take A2 level Computing, which is 57% lower than 2001, and is likely to collapse further if we leave things as they are.

A number of Universities now run a HND in Computing, which is also used by some as a means of direct entry to second year undergraduate programmes. In other words, some Universities are using alternative routes to deliver post GCSE education in Computing. This enables them to cover the foundations of Computer Science; covering topics that are

completely missing from the majority of school classrooms. All of this suggests there are significant systemic problems in the design and delivery of the Computing curriculum.

The problem is not lack of concern from school teachers; many of whom are working extremely hard to improve the way computing is taught within the National Curriculum. There is, however, a serious shortage of Computing specialist teachers and of easy to use, inspirational classroom-ready Computing material. Many non-ICT specialist teachers end up teaching ICT at GCSE and would very much like support in delivering more interesting and intellectually stimulating Computing material, but have no local network of peers to turn to. They struggle to convince their school senior management of the need for more Computing within the ICT curriculum.

BCS believes that Computing is as fundamentally important as Maths as an academic discipline and one that all school children should learn. In the twenty-first century every advanced economy will need the majority of its citizens to be capable of computational thinking. That is why BCS is working with groups such as Computing At School and CS4fn to promote the teaching of Computing in schools.

BCS has been a long standing provider of vocational qualifications and will continue to do so because we believe they are an important benefit to society. Ensuring everyone can be an intelligent user of IT is vital. However, being an accomplished IT user is not the same as having a basic understanding of the principles of Computing. This is where there is general confusion in the National Curriculum, and why Computing as a discipline has been virtually lost in schools.

BCS is one of twenty-four organisations, including the Royal Academy of Engineering, supporting the Royal Society with their study.

BCS coordinated an initial fund raising activity in March 2010 to demonstrate the level of commitment from the Computing community for such a report on behalf of the Royal Society. Many thanks go to all those who provided financial assistance and pledges of funding. Namely the Universities of Cambridge, Edinburgh, Glasgow, Greenwich, Imperial, Leicester, Loughborough, Manchester, Open University, Oxford, Queen's University of Belfast, Sheffield Hallam, Surrey, UCL, York, and Dundee, and larger pledges from BCS, CPHC, EPSRC, Google, Microsoft Research and Praxis. Without this support, the study would not have been possible.

EDUCATION FOR ENGINEERING – A NEW VOICE ON EDUCATION, TRAINING AND SKILLS

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The professional engineering community has come together to present a single voice to Government on the education, skills and training needs of UK engineering.

Over the last 12 months the professional engineering community has created Education for Engineering (E4E), a collaborative body to represent the profession and provide a single coherent voice to Government on education, training and skills needs for engineering.

It has been a very busy first year for E4E. The Coalition Government are writing new policies on schools, the further education sector and higher education, all of which are key to ensuring an adequate supply of engineers and technicians for the future. E4E has been working to shape and communicate our position on all these areas.

To meet the challenges facing engineering, E4E has developed a set of immediate policy priorities for Government which it feels are important across all engineering sectors and have implications for engineering and technology industries.

The six immediate policy priorities that E4E has identified for the Coalition Government are:

- Promoting the standing of qualified technicians and highlighting their contribution to society and the economy;
- Supporting careers education and guidance on professional engineering and technology careers;
- Promoting engineering-related qualifications;
- Reinforcing specialist STEM teaching expertise;
- Ensuring adequate subject CPD and industry experience for STEM teachers, and
- Taking steps to enable a more diverse engineering workforce.

Over the next twelve months E4E will be working with Government and Parliamentarians to ensure that decisions made are in the best interest of engineering which will be of benefit to the broader economy. A copy of the E4E briefing on education and training for engineering can be found at: http://www.educationforengineering.org.uk/e4e_briefing.pdf