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BCS, The Chartered Institute for IT
in association with the Computing At School group
Consultation Response to:

**Removing the duty on maintained schools to follow the information
and communication technology (ICT) Programmes of Study, Attainment
Targets and statutory assessment arrangements**

Dated: Monday, 3 April 2012

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BCS, The Chartered Institute for IT

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Computing At School

“Computing At School” (CAS) is a membership association in partnership with BCS, The Chartered Institute for IT. Its membership includes teachers from over 700 schools, as well as university academics, GCSE and A-Level examiners, educational consultants, and representatives of industry and professional societies. CAS was born out of excitement with the discipline of Computing, combined with a serious concern that many students are being ‘turned off’ Computing by a combination of factors that have conspired to make the subject seem dull and pedestrian. Their goal is to put the thrill and intellectual rigour back into Computing at school. CAS is non-partisan, but has institutional support from Microsoft, Google, and the Council of Heads and Professors of Computer Science.

Contents

Q1 a) Do you agree with the Government's proposal that the statutory Programmes of Study for ICT should be disapplied in maintained schools in England from September 2012?	2
Q1 b) Do you agree with the Government's proposal that the statutory Attainment Targets for ICT should be disapplied in maintained schools in England from September 2012?	4
Q1 c) Do you agree that the statutory assessment arrangements for ICT at Key Stage 3 should be disapplied in maintained schools in England from September 2012?	4
Q2 a) What would be the likely impact in schools of disapplying the existing Programmes of Study and Attainment Targets?	5
Q2 b) How might this vary between different types of school or differentially affect different groups of pupils?	7
Q3 a) Do you agree that schools should be encouraged to deliver a more challenging, rigorous, discipline-related curriculum in ICT, especially by focusing on the foundational principles and practices of computer science?	7
Q3 b) How can schools be best supported to engage with the ICT industry and subject associations in curriculum development, in order to develop innovative and creative approaches to ICT teaching, including the teaching of computer science?	8
Q4) Do you have any other comments you would like to make about the proposals in this consultation document?	9

Read this first

This document is the response of BCS in association with CAS to the DfE consultation¹ 'Removing the duty on maintained schools to follow the information and communication technology (ICT) Programmes of Study, Attainment Targets and statutory assessment arrangements'.

BCS fully supports the submissions to this consultation from:

- E4E, Education For Engineering²
- The Royal Academy of Engineering
- NextGen.Skills³

The questions answered in this document are taken verbatim from the DfE consultation response form.

1

<http://www.education.gov.uk/consultations/index.cfm?action=consultationDetails&consultationId=1802&external=no&menu=1>

² www.educationforengineering.org.uk/about/default.htm

³ www.nextgenskills.com

Q1 a) Do you agree with the Government's proposal that the statutory Programmes of Study for ICT should be disapplied in maintained schools in England from September 2012?

<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not Sure
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Summary

We welcome the withdrawal of the existing ICT Programme of Study, as a signal to schools that a radical re-think is required of the way in which ICT is currently taught. In particular we welcome the Secretary of State's explicit encouragement of Computer Science as a rigorous school subject. Michael Gove, BETT January 2012⁴ : *"Long after today's pupils leave school and enter the workplace – long after the technologies they used at school are obsolete – the principles learnt in Computer Science will still hold true"*.

However, as we describe below in Q2 a), there is a real danger that head teachers will take the withdrawal of the Programme of Study as a signal they are free to withdraw from teaching ICT as a discrete subject altogether, the very opposite of what the Secretary of State intends. To avoid that outcome, the DfE should set a context that encourages the outcomes it desires. Specifically:

- We would welcome a clear statement of intent, building on Mr Gove's endorsement of Computer Science in his BETT speech, along the lines of the DfE response to the Henley Report (see "Leadership" below). We recommend that DfE makes a policy level commitment to facilitate and promote the efforts of technology-creating employers, universities, learned societies, professional bodies and schools to introduce Computer Science as a core school subject.
- We recommend that DfE adopts the aim of enabling every secondary school by 2020 to offer a recognisable strand of Computer Science up to Key Stage 3 and to enable at least half of them to also offer a GCSE in Computer Science. We further recommend that DfE work with the above key stakeholders to create a high level road-map of how that aim can be achieved, which is published by September 2012.
- We believe it is essential to establish a national network of teaching excellence in Computer Science, which links schools with universities, employers, learned societies and professional bodies. We would welcome DfE's endorsement for such a network and active participation in determining how to establish and ensure its long term success. See Q 3b) for further details.
- In consultation with key stakeholders Ofsted should determine appropriate educational standards for Computer Science within the statutory strand of ICT that remains beyond the proposed disapplication, so that schools have clarity and transparency on how they will be assessed. See Q2 a) for further details.

⁴ <http://www.education.gov.uk/inthenews/speeches/a00201868/michael-gove-speech-at-the-bett-show-2012>

- Last, but not least, the current incentive structure within which schools operate specifically discourages them from offering Computer Science at GCSE. One of the most effective mechanisms for DfE to encourage schools to offer and resource rigorous core subjects such as English, Maths and Science, is through the English Baccalaureate (EBacc). The most direct impetus DfE can give to schools is to include Computer Science in the EBacc. This would cost nothing but would give an unambiguous signal of the importance of Computer Science. See Q2 a) for further comments.

Context

It is very welcome and significant to the direction of future educational policy that the Secretary of State has unequivocally stated:

- Computer Science is a rigorous subject discipline that can and should be taught at school
- Sufficiently rigorous and academic Computer Science GCSEs can be considered for inclusion in the English Baccalaureate (the EBacc)

This echoes the recommendations of the Livingstone Hope skills review of the Video Games and Visual Effects industries⁵, which was called for by Ed Vaizey, Minister for Creative Industries.

The Royal Society report⁶ ‘Computing in Schools: Shut down or restart?’ succinctly explains the current ICT problem: *“The ICT National Curriculum has accommodated a wide range of teaching and content, and in the course of this study we have found examples of imaginative and inspiring teaching under the ICT heading. Sadly, however, these positive examples are in a minority, and we have found far too many examples of demotivating and routine ICT activity, and a widespread perspective among pupils that “ICT is boring”.*”

That report strongly advocates teaching Computer Science as a significant part of a balanced computing curriculum which is important for the future wellbeing of society and the economy.

Leadership

While it is beneficial that the DfE step back from defining prescriptive programmes of study, DfE still has a leadership role in ensuring schools teach the academic principles and concepts required for a rigorous understanding of Computer Science. The DfE also has a clear leadership role in fostering collaboration and cooperation between schools and expert groups (including professional bodies, learned societies and technology creating companies) who can help and support schools.

A good example of how DfE does provide leadership is the response to the Henley Report on Music. The DfE published a 60-page guidance document whose opening paragraphs say:

⁵ http://www.nesta.org.uk/events/assets/features/next_gen

⁶ <http://royalsociety.org/education/policy/computing-in-schools/report/>

“Children from all backgrounds and every part of England should have the opportunity to learn a musical instrument; to make music with others; to learn to sing; and to have the opportunity to progress to the next level of excellence.”

It goes on to say

“So, for the first time, the Government is publishing a National Plan for Music Education. The very existence of this plan underlines the unswerving commitment by both the Department for Education and the Department for Culture, Media and Sport to recognise the importance of music in the lives of young people and to ensure that we consistently give young people a music education that is of the highest quality.”

Clear statements like these about Computer Science would set a context for the strategic decisions schools will make about what subjects to teach and how, acting as a multiplier for the resources that the wider community is bringing to bear.

Q1 b) Do you agree with the Government's proposal that the statutory Attainment Targets for ICT should be disapplied in maintained schools in England from September 2012?

<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not Sure
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Please see our comments to Q1 a)

Q1 c) Do you agree that the statutory assessment arrangements for ICT at Key Stage 3 should be disapplied in maintained schools in England from September 2012?

<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not Sure
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If the current Programme of Study is removed it is not sensible to continue with the current statutory assessment arrangements since they are closely tied to the Programme of Study. However, all pupils must be skilful, creative, purposeful and safe users of information and communication technology before they leave school.

It is important that schools objectively assess pupils' IT skills during Key Stage 3, so that students who need remedial attention are sure to receive it. From anecdotal evidence we believe as many as 20% of year 6 pupils do not have the minimum level of IT user skills they require to successfully use digital software and technology at secondary school.

We recommend that DfE make explicit the expectation that all pupils should become skilful, creative, purposeful, and safe users of digital technology by the time they leave school and that secondary schools are expected to take appropriate remedial steps for those Key Stage 3 pupils that have not developed sufficient aptitude.

Please also see our comments to Q1 a)

Q2 a) What would be the likely impact in schools of disapplying the existing Programmes of Study and Attainment Targets?

Although there are many schoolteachers interested in Computer Science, it does not follow that head teachers will agree to introduce the subject in their school. A head teacher will want to see the following prerequisites before agreeing to such a change:

- to know what academic principles and concepts schools are expected to teach, which will remain fixed over the long term even though each school will decide how best to bring them to life through inspirational and innovative pedagogy that continuously evolves year on year
- to have teachers with expert knowledge in the discipline
- to have support from organisations who will help them move from ICT as it is now to Computer Science as we would like it to be
- to have incentives for investing time and people in radically changing a core component of their school's education
- to know that Ofsted will value their investment in Computer Science.

It is vital for DfE to take a leadership role in helping schools achieve these prerequisites if the Secretary of State's aspirations for schools are to be achieved. If all that happens is the removal of the existing Programmes of Study and Attainment Targets it seems highly unlikely that head teachers will achieve any of the above prerequisites, see Q 1(a) for further comments.

The English Baccalaureate

The most direct impetus the DfE can give to Computer Science is to include it as an option within the EBacc. This would cost nothing but would give an unambiguous signal of the importance of Computer Science.

Head teachers live and die by their school's league table results. Although the English Baccalaureate is not an official performance measure, the EBacc results are published and media organisations use them to compile their own league tables. Many universities have shown an interest in the EBacc with regards to possible future entrance criteria, which reinforces their perceived importance to head teachers. Therefore head teachers will direct resources to improving their performance as measured by the EBacc. As far as head teachers, school governors and parents are concerned the EBacc is a benchmark measure.

Computer Science should be seen as the "fourth science". We believe that it is important for every child to learn some science (physics, chemistry, etc) because they live in a world governed by physical and chemical laws. Today they also live in a world in which computation and digital systems underpin almost every aspect of science, engineering, technology and business. Empowered citizens must have some understanding of how their world works, regardless of their ultimate career path.

We recommend that the DfE engage with key stakeholders in the computing community, including learned societies, professional bodies, subject associations, universities, exam boards and technology creating companies, to determine under what circumstances new

Computer Science GCSE would be suitable for inclusion in the EBacc. We recommend that the DfE takes into account the views of these stakeholders when considering if the new GCSE are rigorous, that they cover in depth the principles and concepts of Computer Science, and whether they equip pupils for further academic study and help lead to professional careers.

Ofsted

Schools have strong incentives to get good reviews from Ofsted. Yet the current criteria that Ofsted uses to review standards of ICT education in schools⁷ makes no reference to Computer Science, instead mentioning “use of ICT” and “all strands of the statutory National Curriculum are covered” and “use of ICT skills in realistic situations”. It is far from clear how these criteria will be interpreted if the Programme of Study for ICT is withdrawn.

Given the clear statements from the Secretary of State on the importance of Computer Science, it seems reasonable to assume DfE expects Ofsted to develop suitable educational standards that can be used to properly assess if schools are delivering a rigorous strand of Computer Science in their curriculum. However this broad expectation should be made explicit to make sure it happens in practice. Without such guidance schools cannot know how their future performance is to be scrutinised by Ofsted, which means they will face an unquantifiable risk, particularly associated with their provision of Computer Science.

For Ofsted to effectively assess the standard of Computer Science education being achieved in schools, it will need authoritative guidance on the appropriate principles and concepts that should be taught, and should consult with key stakeholders to develop this guidance. Ofsted must also be able to measure whether teachers are applying best practice and engaging in appropriate CPD, which are essential indicators of an outstanding educational environment.

Abandoning ICT as a discrete subject

Removing the Programme of Study without providing additional guidance on future intended outcomes leaves head teachers the option of not teaching ICT at all, including not teaching Computer Science. This possibility is evidenced by the 2008⁸ and 2011⁹ Ofsted reports on ICT that point out even the small amounts of computer programming that are a statutory part of the current curriculum are often not taught. Also, according to the 2011 Ofsted report:

“In outstanding secondary schools ICT was seen by the headteacher as an engine for innovation and raising standards. In contrast, half of the secondary schools surveyed in which leadership and management of ICT were no better than satisfactory had common weaknesses that included insufficient attention given to progress in ICT across the curriculum and lack of support for staff in teaching more challenging topics.”

⁷ http://www.ofsted.gov.uk/sites/default/files/documents/inspection--forms-and-guides/supplementary_subject_specific_guidance/Supplementary%20subject-specific%20guidance%20for%20ICT.pdf

⁸ <http://www.ofsted.gov.uk/resources/importance-of-ict-information-and-communication-technology-primary-and-secondary-schools-20052008>

⁹ www.ofsted.gov.uk/resources/ict-schools-2008-11

Hence, although it is not the intention of the current proposal, there is a significant risk that many head teachers will choose to withdraw from teaching ICT as a discrete subject altogether, whilst nominally delivering a statutory ICT component by embedding it across the curriculum. This would be contrary to the Secretary of State's aim of encouraging more schools to teach Computer Science.

There is already anecdotal evidence that, far from using the new freedom to explore innovative Computer Science curricula, some schools are already withdrawing from ICT at Key Stage 3 and 4, to focus on EBacc subjects. It is difficult to obtain hard data on such matters, since decisions for what will be taught from September 2012 have mostly not yet been made, but we have received reports from several schools that they are already planning to reduce or close their ICT departments.

An academic at the Institute for Education has been conducting a school questionnaire about plans for ICT. He has interviewed five schools so far, with the following responses:

- *"ICT at KS3 to be dropped next year. To be delivered "cross curricular", but no plan of how this will actually work."*
- *"ICT at KS3 back into a carousel with food technology and Design Technology. So effectively back to 1988 when "IT" was considered to be part of design technology and confined to 1 term - effectively cut by 66%".*
- *"ICT lessons at KS3 halved".*
- *"No plans for change. But this is an independent school so no real need to pay attention to top down policy."*
- *"Proposals to cut ICT at KS3 to focus on English and Maths. Previous attempts to remove ICT at post 16 prompted a revolt from parents."*

Although so far we have only anecdotal evidence the early indications give cause for real concern.

Q2 b) How might this vary between different types of school or differentially affect different groups of pupils?

We do not have any evidence to sensibly comment on this question.

Q3 a) Do you agree that schools should be encouraged to deliver a more challenging, rigorous, discipline-related curriculum in ICT, especially by focusing on the foundational principles and practices of computer science?

<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not Sure
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We wholeheartedly endorse what we see as the central vision in the Royal Society report⁶ as quoted verbatim here:

"Every child should have the opportunity to learn Computing at school. We believe that:

- *Every child should be expected to be ‘digitally literate’ by the end of compulsory education, in the same way that every child is expected to be able to read and write.*
- *Every child should have the opportunity to learn concepts and principles from Computing (including Computer Science and Information Technology) from the beginning of primary education onwards, and by age 14 should be able to choose to study towards a recognised qualification in these areas.”*

We also wholeheartedly endorse and repeat the views of the E4E group in their response to the National Curriculum review¹⁰. Every school pupil should encounter Computer Science because:

- Universal scientific, engineering, mathematical and business principles, concepts and methods can be encoded in formal languages that a human can understand and a digital computer can execute automatically.
- The rigorous design and automation of different kinds of machine executable languages is unique to Computer Science; in particular designing and building languages capable of describing elegant, efficient solutions to hard real-world problems that affect our societal wellbeing as well as our future economic prosperity.
- Computer Science develops a way of thinking about issues, problems and situations that uses the powers of logic, algorithm, precision and abstraction (understanding through analysis and reconstructing from the constituent parts) - it is a scientific, engineering and mathematical approach.
- Computer Science supports economic well-being at the personal (intellectual), vocational (employability), social (stronger work force) and national (more competitive market force) levels.

Education for Engineering (E4E) is the mechanism by which the engineering profession offers coordinated and clear advice on education to UK Government and the devolved Assemblies. It deals with all aspects of learning that underpin engineering. E4E represents the collective views on education and training policy of 36 Professional Engineering Institutions, the Engineering Council, EngineeringUK and the Royal Academy of Engineering.

Q3 b) How can schools be best supported to engage with the ICT industry and subject associations in curriculum development, in order to develop innovative and creative approaches to ICT teaching, including the teaching of computer science?

These comments should be read in conjunction with our comments to Q2 a). BCS and CAS, in collaboration with CPHC, UKCRC, the Royal Society, the Royal Academy of Engineering, E4E, NESTA, Next Gen, and with support from companies such as Microsoft and Google, as well as many others, have been vigorously promoting the importance of Computer Science over the last few years. These organisations are willing to provide support and help to schools. *However, they do not have the resources to provide comprehensive professional development and classroom resources to every school in England.* In national-budget terms, very small sums are required to coordinate a CPD programme and pay for logistics and

¹⁰ http://www.educationforengineering.org.uk/policy/pdfs/E4E_NC_Review.pdf

school cover during an initial three year seed-funding period, but it is unrealistic to expect a national programme of CPD to be funded entirely by volunteers.

There needs to be a step change whereby Computer Science gains institutional long term support from schools in order for it to become an accepted part of business as usual. If the proposals to disapply the current ICT programme of study go ahead from September 2012 there is an urgent need to create a big-bang effect leading to a critical mass of schools teaching Computer Science at Key-Stage 3 and 4 over the next three years. We believe it is essential to establish a national network of teaching excellence in Computer Science, as described in Q1 a). For that to happen there needs to be a credible three year road map that shows how a significant proportion of schools can effectively move from ICT as it is now to Computer Science as we want it to be. In particular, that road map has to address continual improvement in the professional development for the existing workforce. We believe this can be done with very modest funding provided DfE takes a leadership role in proactively facilitating the computing community's efforts to make this happen.

We recommend the DfE engage with the computing community to create such a road map for schools to be published before September 2012, and to proactively facilitate executing it.

Q4) Do you have any other comments you would like to make about the proposals in this consultation document?

We strongly encourage DfE to talk directly to technology-creating companies, universities, learned societies, professional bodies, and schools when deciding how best to encourage the introduction of Computer Science in schools. Below as a case study we look at the design and development of the IT Diploma, which shows why more weight should be given to these organisations with regards to Computer Science than businesses that use digital technology but do not create it.

Case study

In collaborating with the wider stakeholder community it is important to learn the lessons from past mistakes, such as for example those relating to the IT Diploma. We consider this example as the IT Diploma specifically states it focuses on IT professional skills, unlike many other popular ICT vocational qualifications that develop IT user skills. The other reason for looking at the IT Diploma is because the views of employers across all business sectors were widely sought when designing its curriculum and assessment methods, from high-street retailers to high-technology creating companies, and all those views appear to have been given equal weight. That resulted in a qualification focused¹¹ primarily on business-related *'Personal, Learning and Thinking Skills, which employers often value more in new recruits than specific subject matter expertise'*. As a result of consulting very broadly across all employers the IT Diploma was not designed to equip pupils with an understanding of the underpinning scientific and engineering principles of how digital technology and software works or with the ability to create them; in fact it appears many of those employers thought this level of understanding was not relevant to their workforce.

Evidence to the Education Select Committee¹¹ in 2007 illustrates how the IT Diploma was designed to take account of the views of employers ranging across a wide range of sectors, from high-street retail stores to high tech companies. We include an extract from that evidence to illustrate how those employers' views drove the design of the IT Diploma: *"it [the IT Diploma] focuses on IT professional (rather than IT user) skills. [...] In addition, more than 600 employers, statistically valid by size and geography, contributed to the design through detailed telephone interviews.*

Through this design work, employers were able to clearly articulate, at a sector-wide level, the key principles they would like embedded within the Diploma in order for it to be a valued qualification and a boost to student employability. This included, for example, the centrality of improved standards in skills in English and maths and how this could be achieved through engaging, work-relevant contexts, and innovation in the development of the Personal, Learning and Thinking Skills, which employers often value more in new recruits than specific subject matter expertise.

Employers also want to seize the opportunity to radically improve the IT-related curriculum for 14-19-year-olds through exciting, up to date content delivered in an innovative way. The Diploma in IT is, in response to the overwhelming view of employers, based on the three themes of Business, People and Technology."

Hence according to the 2007 evidence to the Education Select Committee, it seems many of these 600 employers believed the IT Diploma supported employability and progression into the IT Profession despite the fact it does not teach pupils how to create software or hardware or how they work. What is more this evidence states that these employers decided what should go into the IT Diploma in the first place. The IT Diploma therefore supports progression into that part of the IT profession that does not require Computer Science expertise. This is at odds with the views of global technology creating companies, universities, learned societies and professional bodies who have clearly stated they want pupils to learn Computer Science at school. This is a good example of why it is important for DfE to give additional weight to the views of subject matter expert bodies about introducing Computer Science into schools.

Wolf Report

It is interesting to contrast the above particular employer view reported to the Education Select Committee with the following quote included in the Wolf review of vocational qualifications¹² from the Head of the ICT Faculty at Cottenham Village College who explained (P116):

"We were running the Diploma in IT. We have abandoned it for two reasons.

- 1. It is 90% business and only 10% IT.*
- 2. It is 90% report writing and 10% doing IT.*

There is a pretence that the Diploma in IT is hands on. But when one examines the mark schemes (which are, after all, the indicators of the value of each topic), one finds that less

¹¹ <http://www.publications.parliament.uk/pa/cm200607/cmselect/cmmeduski/249/7011704.htm>

¹² <https://www.education.gov.uk/publications/standard/publicationDetail/Page1/DFE-00031-2011>

than 10% of the marks are given for doing IT work (building websites, creating databases, creating videos, etc.) and the vast majority of the rest of the marks are for writing reports on IT.”

This evidence demonstrates why it is important to give greater emphasis to the views of technology creating companies and other appropriate expert bodies (universities, learned societies and professional bodies) when considering what kind of Computer Science qualifications are required in schools.

We also comment that in seeking the views and support of key stakeholders with appropriate expert subject knowledge the DfE should work with them directly. We base this view on the findings of the Wolf report, which states on P65: *“the complexity, and the range of responsibilities delegated to current English agencies and bodies (some statutory, and some not) raises issues of:*

- *Whether important policy decisions are being delegated to non-accountable bodies*
- *Whether lines of authority are clear within government and between agencies*
- *Cost. The more bodies are involved in decision making, the greater the cost financially and in time. This is especially true when there are multiple connections between and among them*
- *Transparency. A lack of transparency is itself a source of inefficiency and therefore costs responsiveness to bodies and individuals which are not part of the regulatory structure itself (including, in this case, individual employers, trade bodies, awarding bodies, universities as well as individual students and ‘learning providers’)*”

We believe this second comment is especially pertinent when considering who should be consulted concerning the possible inclusion of new Computer Science GCSEs in the EBacc.