UK Digital Skills Taskforce
Science Council evidence

1. The Science Council

1.1. The Science Council was established in 2004. It is an umbrella organisation of learned societies and professional bodies, and currently has 41 member organisations drawn from across science and its applications: a list of current member bodies is attached. In addition to providing a mechanism for the sector to work collectively, the Science Council develops and leads collaborative projects working with member bodies and the wider scientific community: examples include the Future Morph website[1] designed to provide young people with information about careers opportunities, LMI analysis of the UK Science Workforce[2], and the Diversity, Equality and Inclusion Strategy Group[3].

1.2. The Science Council works to advance the professional practice of science and since 2004 has awarded the professional qualification of Chartered Scientist (CSci) with 15,000 individuals registered. A current key project is the development of new professional registers (Registered Scientist and Registered Science Technician), which aims to raise the profile, aspirations and retention of scientists at graduate and technician level.

1.3. Collectively our member bodies represent almost 500,000 individual members, including scientists, teachers and senior executives in industry, academia and the public sector.

1.4. In preparing this submission we have consulted member bodies to identify areas of common interest and the issues they raised form the content of this submission. In addition a number of member bodies will be responding individually to the inquiry.

2. Future demand for digital skills

2.1. Modern science is a global activity. The scale and immediacy of the issues the world faces, such as climate change, global population growth, and global resource and food security, together with the pace of change in science and technology demands increasing interaction and cooperation between countries and scientists working in international multi-disciplinary teams. Digital infrastructure and new digital technologies will enable this process, for example creating the ability to model and monitor weather patterns, or to enable efficient management and use of global resources. Other examples of digital innovation will:

- Assist governments and international bodies to make evidence-based policy decisions. Scientists will increasingly need to be confident and adept at accurately collecting, handling, analysing and utilising large-scale data sets. Recent Science Council research[4] found that the ICT workforce is projected to increase by 39% by the year 2030. Research has also found that over the next five years UK employers' demand for 'big data' specialists will rise by 243%[5]. This will require the future science workforce to possess high-level digital skills.

- Enable more efficiently monitoring and regulation a range of activities. It is now the case that complex data submissions to regulatory authorities are done electronically using the electronic Common Technical Document for specially developed web portals. Regulatory specialists are now increasingly required to understand how to operate digital platforms. Some regulatory scientists have

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1 www.futuremorph.org
2 *The current and future UK science workforce* TBR, Sept. 2011 http://www.sciencecouncil.org/content/science-workforce
3 http://www.sciencecouncil.org/content/diversity-equality-and-inclusion
4 http://www.sciencecouncil.org/sites/default/files/UK_Science_Workforce_FinalReport_TBR_2011.pdf
5 http://www.e-skills.com/research/research-publications/big-data-analytics/#November

chosen to move into document management software development, which has produced a separate sub-specialism of regulatory affairs called 'regulatory operations'

- Help ensure safe and efficient transport of people and goods across the world.

  Help ensure online privacy and cyber security

- Develop new wealth creators in the UK in the areas of telecommunications and digital media platforms as well as in the application of digital technologies in service and public sectors

2.2. In other economic sectors, the use and application of digital skills will become increasingly prevalent. Future demand for digital skills will not just be for specialist developers, but also for scientists across disciplines and economic sectors looking to maximise incremental advances in technology and services by applying digital technologies to enhance existing procedures and practices. For example:

- The European Union has designated that any software packages used in the health profession are to be considered 'medical devices'[6]. The application of these devices has meant the need for regulations to be developed alongside to cope with rapid technological development. Moving forward it will require software developers, doctors, scientists and lawyers specialising in regulation to develop a high-level understanding of digital technologies and their applications in order to develop appropriate laws, assessment criteria, and guidance for the safe use of such products.

2.3. The application of digital skills and use of digital platforms will not be confined to specialists and high-end users. As people move, organise and manage more aspects of their lives onto digital platforms, such as online shopping, paying bills and online communication, it is important that people become 'Digital Citizens'.

- However, for those without regular and easy access to a computer or the internet, the 'digitisation' of these services can be demanding. As government and businesses gradually transfer access to and information about services and products online, there will be an increasing need for Government to invest in education for all citizens to successfully handle this change.

3. Digital skills in the national curriculum

3.1. It is essential that all young people have the opportunity to access digital skills teaching and learning in schools and colleges so that they become confident users of digital technologies regardless of the subjects they study or their future career.

3.2. Research shows that the growing 'computerisation' of the labour market is likely to lead to more routine-intensive occupations such as those in Accounting, Insurance and across manufacturing, becoming automated[7]. Without long-term planning across education and the economy, the future labour market will therefore become polarised between high-skilled, high-income jobs and low-skilled, low income jobs. To ensure meaningful and productive employment opportunities for young people and ensure that the labour market has the supply of the skills it requires, young people will need to acquire non-routine skills such as problem-solving and creative skills which they can combine with computing and digital skills to create new knowledge, products, services and technologies.

3.3. Within the national curriculum there may be value in examining the merit of a 'twin track' approach to the teaching of digital skills in schools and colleges, both at GCSE and A-level. At A-level for example, young people studying subjects with a low demand for high-level digital skills, such as English and modern languages, might have the option to study 'core' digital skills learning to develop beyond the basic and intermediary digital literacy to become 'Digital Citizens'. It may also encourage them to

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[6] http://ec.europa.eu/health/medical-devices/files/meddev/2_1_6_ol_en.pdf
[7] http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

use these skills in innovative ways in other areas of study that have not hitherto been considered. Those studying subjects with a high demand for high-quality digital skills, such as science and mathematics subjects could receive greater, in-depth learning to develop the skills needed to become 'Digital Workers' or 'Digital Creators'. It will be essential that digital skills are embedded and taught within and across those curricula rather than in isolation.

- It would be worth exploring the potential for subjects such as geography to embed the teaching of high-level digital skills in their curricula. This already occurs in the United States where the National Council for Geographical Education has designed a skills map for teaching 21st Century Geography in schools[8]. The map provides schools and teachers with guidance on how to integrate digital technologies across many facets of the Geography curriculum.
- Increasingly cross-disciplinary subjects that utilise both natural and social sciences are applying high-level digital technologies and applications to traditional research and investigative methods to digitally map landscapes, urban and rural environments and as yet unchartered parts of the globe. The Government's recent investment in a new polar ship[9] that will use digital and remote technologies to map underwater polar environments is one example of this.

3.4. The Science Council would not wish to see digital skills taught predominantly within the mathematics curriculum where we consider the curriculum to be already crowded. There would be a danger in un-doing the progress achieved in recent years in developing increased interest in mathematics post-16. As an essential element of all many science roles, digital skills need to be embedded and taught in a way that supports all science and mathematics curricula.

3.5. One of the challenges of introducing the new computing curriculum that will develop and foster the digital skills of a future workforce is ensuring that there is an adequately trained teaching workforce, but there is a significant shortage of qualified IT teachers. A recent Royal Society[10] report highlighted the shortage in teachers able to teach above basic digital literacy, with approximately only one third of the 18,000 IT teachers in secondary schools possessing a qualification directly relating to IT. It is important that young people have the opportunity to be taught by qualified teachers with appropriate subject knowledge in their discipline at each education level, especially post-16. Therefore the challenge remains how to ensure that existing qualified IT teachers have the right skills and knowledge to teach the new curriculum.

3.6. An additional concern across the science community is that teaching salaries for IT graduates disincentivises potential teachers, as the profession cannot compete with the salaries of IT jobs in other sectors of the economy. More highly qualified teachers are needed to enter the profession to meet the expected future economic demand for science and mathematics qualifications. A number of Science Council member bodies[11] [12] already offer attractive scholarships for prospective teachers in their respective subjects. Government and the teaching profession must look to employ further incentives that attract more IT graduates into the profession, such as appropriate training and progression routes, financial incentives and mechanisms to attract and retain new graduates, returners and those changing career.

4. Access to digital skills learning and teaching beyond the national curriculum

4.1. Digital skills teaching and learning should also be available to all young people outside the classroom. This has occurred to some extent through the proliferation of Massive Open Online Courses (MOOCs), enabling more young people to access wider

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8 http://www.p21.org/storage/documents/21stcskillsmap_geog.pdf
9 https://www.gov.uk/government/news/chancellor-puts-uk-at-forefront-of-ocean-research-with-new-polar-science-ship
10 https://royalsociety.org/~/media/education/computing-in-schools/2012-01-12-computing-in-schools.pdf
11 http://www.ima.org.uk/careers/teacher_scholarships.cfm.html
12 http://www.iop.org/education/teach/itts/page_52632.html

teaching and knowledge. Although evidence shows that less than 7% of people finish a course[13], they have the potential to revolutionise how and where people learn and acquire knowledge. However, MOOCs and other online learning tools are only available to those with ready access to a computer and the internet. This is a particular challenge to young people from less advantaged backgrounds and those living in more rural areas, who may not have the same access as their counterparts from more advantaged backgrounds and those living in urban areas. In many parts of Wales and Scotland, and some regions of England for example, access to reliable broadband internet ranges from 0% to 30%[14]. The lack of reliable internet connection in these areas also affects the ability to develop and operate a digital business. It is critical that the Government accelerates its plan to provide adequate broadband connection to the whole of the UK and there is a need to consider additional support to enable schools and colleges in areas of poor broadband availability to support access to the internet for their students and other learners.

- The Department for Education's Home Access programme, which provided more than 270,000 low-income families with access to a computer and the internet, closed in June 2010[15]. An evaluation of the programme in 2010 stated that it had been an effective and sound investment which had led to enhanced use of home access for education and improved ICT skills and confidence[16]. The Department must look at the business case for establishing similar programmes.

5. The role of careers information and guidance

5.1. Careers information, advice and guidance for young people remains poor, particularly with regard to subject and qualification choice where ill informed choices mean career pathways are often closed. At a time when young people are expected to make an increasing financial contribution towards their education and training, it is crucial that they are able to access accurate information, advice and guidance to inform their choices, and that they fully understand both the importance of digital skills to STEM-based careers in general, and the opportunities that exist in the digital economy.

5.2. All stakeholders, including employers, Government, education and training providers, and professional bodies will need to clearly articulate to young people the importance of digital skills in STEM-based careers. They will need to collaborate to provide high-quality accurate information and messages about the qualifications, skills needs and range of career opportunities and environments for young people to work both within the digital sector and beyond it.

6. Raising the importance of digital skills among policy-makers

6.1. Digital technologies enable businesses across the whole of the UK, especially SMEs and micro-enterprises in both urban and rural economies to operate in the global market place, trading with and selling high-value products or services anywhere in the world, especially to fast growing and emerging economies. These businesses provide growth and jobs to their localities and throughout the UK's supply chains. High-level digital skills will also provide the catalyst in rural economies for greater application and use of innovative farming and agriculture methods, enabling the UK in the long-run to become more food secure as new technologies and innovation enable greater crop yields to be harvested.

6.2. The business case for increased government investment digital infrastructure and skills, which lead to jobs and growth within their constituencies and to the wider UK economy, must be strongly made by employers, education institutions and professional bodies to Parliamentarians.

6.3. High-level digital skills are required across all government departments and their

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[13] file:///C:/Users/oliver/Downloads/SSRN-id2381263.pdf
[14] http://maps.ofcom.org.uk/broadband/
[15] http://webarchive.nationalarchives.gov.uk/20140107120021/www.education.gov.uk/popularquestions/a0077612/home-access
[16] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/181525/DFE-RR132.pdf

sectors of responsibility. There should be a cross-departmental Minister responsible for the digital skills and technology reporting to the Cabinet Office. The Minister would need to work closely with Departmental Chief Scientific Advisors and the government Chief Scientific Advisor to ensure civil servants' continued professional development in digital skills.

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Member Bodies of the Science Council

February 2014

Association for Clinical Biochemistry and Laboratory Medicine
Association of Neurophysiological Scientists
Association for Science Education
British Academy of Audiology
British Association of Sport and Exercise Science
British Computer Society
British Psychological Society
British Society of Soil Scientists
Chartered Institution of Water and Environmental Management
College of Podiatry
Energy Institute
Geological Society of London
Institute of Biomedical Science
Institute of Brewing and Distilling
Institute of Corrosion
Institute of Food Science and Technology
Institute of Marine Engineering, Science and Technology
Institute of Materials, Minerals and Mining
Institute of Mathematics and its Applications
Institute of Measurement and Control
Institute of Physics and Engineering in Medicine
Institute of Physics
Institute of Science and Technology
Institute of Water
Institution of Chemical Engineers
Institution of Environmental Sciences
London Mathematical Society
Mineralogical Society
Nuclear Institute
Oil and Colour Chemists' Association
Operational Research Society
Physiological Society
Royal Astronomical Society
Royal Meteorological Society
Royal Society of Chemistry
Royal Statistical Society
Society for Cardiological Science and Technology
Society for General Microbiology
Society of Biology
Society of Dyers & Colourists
The Organisation for Professionals in Regulatory Affairs