House of Commons

Science and Technology Committee

Digital skills crisis: Government Response to the Committee's Second Report of Session 2016–17

Fourth Special Report of Session 2016–17

Ordered by the House of Commons to be printed 11 January 2017

Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Government Office for Science and associated public bodies.

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The following were also members of the committee during the parliament:

Nicola Blackwood MP (*Conservative, Oxford West and Abingdon*)

(Chair of the Committee until 19 July 2016)

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The Committee is one of the departmental select committees, the powers of which are set out in House of Commons Standing Orders, principally in SO No 152. These are available on the internet via www.parliament.uk.

Publication

Committee reports are published on the Committee's website at www.parliament.uk/science and in print by Order of the House.

Evidence relating to this report is published on the relevant inquiry page of the Committee's website.

Committee staff

The current staff of the Committee are: Simon Fiander (Clerk); Marsha David (Second Clerk); Sean Kinsey (Second Clerk); Dr Elizabeth Rough (Committee Specialist); Martin Smith (Committee Specialist); Amy Vistuer (Senior Committee Assistant); Julie Storey (Committee Assistant); and Nick Davies (Media Officer).

Fourth Special Report

On 13 June 2016 we published our Second Report of Session 2016–17, Digital skills crisis [HC 270]. On 5 January 2017 we received the Government's response to the Report, which is appended below. We have written to the Government minister for digital and culture policy about the long delay in receiving it and the continued absence of the Government's long-promised 'Digital Strategy', much of which was the focus for our report. Our letter is published on our website.

Appendix: Government response

The House of Commons Science and Technology Committee published the report of its inquiry into the "Digital Skills Crisis" on 13 June 2016. This document sets out the Government's response to the Committee's report. In some cases these responses reflect our existing work across the digital skills agenda as we continue to develop policy in this vital area. In other cases, we have outlined the activities and steps we have taken to address the issues raised and highlighted through the recommendations.

We would like to thank the Committee for their report and for raising the profile of an incredibly significant area of cross-Government interest and activity.

Introduction

The advancement and establishment of the digital economy has emphasised the power of technology—and the sheer challenge of keeping pace with it—across the world. The Gross Value Added (GVA) of the digital sector in the UK was estimated at £118.4 billion in 2015—an increase of 6.1% from 2014.[1] The Government recognises the economic and social value of successful, significant participation in the digital economy for individuals, businesses, and wider society and recognises that this must be achieved through the acquisition of appropriate digital skills. These skills should reflect the ever-evolving demands of the digital and tech sector, and the corresponding shortages that emerge alongside them.

10% of UK adults have never used the internet[2] and 12.6 million (23%) lack the basic digital skills required to fully participate in the digital economy and benefit from wider outcomes (eg. financial inclusion, take-up of government digital services, reduced isolation, improved job opportunities, better health and wellbeing).[3] In 2014, there were 1.4 million jobs in the digital sector[4] and research from the Tech Partnership predicts that by 2023 the economy will require one million new people to fill digital roles. The rise in digital roles and vacancies across the labour market has opened significant doors for retraining opportunities, and has raised the importance of developing effective digital skills through the curriculum, education system, workforce and later life.

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1   https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/544103/DCMS_Sectors_ Economic_Estimates_-_August_2016.pdf

2   http://stakeholders.ofcom.org.uk/market-data-research/other/research-publications/adults/media-lit-2016/

3   https://doteveryone-prod.s3-eu-west-1.amazonaws.com/uploads/Basic%20Digital%20Skills_UK%20Report%20 2015_131015_FINAL.pdf?utm_source=insights%20page&utm_medium=bdsresearch&utm_ campaign=insights%22%20target=%22_blank

4   https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/503666/Digital_Sector_ Economic_Estimates_-_January_2016_Revised.pdf

The challenge for the UK is vast and forever evolving as new technologies emerge and the demands for digital skills change and adapt in response. Government continues to work to understand where those gaps are most predominant, and we are working closely with industry, education and training bodies and charity organisations to reduce these gaps.

We have taken significant steps towards improving the development of digital skills in the UK through forging close inter-departmental collaboration and building close working relationships with key industry partners and stakeholders—such as Tech Partnership—so we can use appropriate expertise to draw on evidence, information and knowledge in this area as we shape the future direction.

In order to have an effective and productive society, the Government recognises that it is important that all adults have the opportunity to develop the basic digital skills they need to operate effectively in day to day life. The digitally excluded face a wide range of obstacles on a daily basis, both in terms of their access to the job market and challenges when accessing government and other online services. The Government is introducing legislation through the Digital Economy Bill, which will mean publicly-funded basic digital skills training being offered by providers will be free of charge to adults who need it.

We are taking steps to grow the development of digital skills in schools and throughout the education system—from primary education to Further and Higher Education. In September 2014, we launched the new computing curriculum with a greater emphasis on the computational thinking skills needed by all young people to support the future digital economy and we have been providing funding to prepare teachers to teach the new curriculum. Bursaries of up to £25,000 are also available to encourage the brightest and best graduates to become computer science teachers.

In November 2015, the Chancellor confirmed funding for the Ada National College for Digital Skills which will have a key role to play in raising teaching excellence. The College's ambition is to reach 5,000 students within five years (with 40% of students being female). In the same month, the Government also announced a new Institute for Coding to enable us to further develop the higher-end digital skills required for the UK economy.

Universities and employers are also collaborating to provide the innovative digital degree apprenticeship, enabling young people to get the mix of technical and professional skills required by the industry. Building on this, we will be taking forward recommendations made in May 2016 within Sir Nigel Shadbolt's report on Computer Science degree courses and graduate employability issues in this area. Also in Higher Education, as announced in March 2016, we are investing £1.7m for 28 projects to develop computer science and wider engineering conversion courses. These will focus on high demand skills areas including data analytics and cyber security, thus providing further skills needed for the economy.

The Government has consistently sought the views of industry experts, specialists and leading organisations in the digital and tech sector to help shape action on digital skills, and we will continue to do this. A key demonstration of this is the reform of Apprenticeship Standards—ensuring that employers are able to design standards that reflect their needs and those of the wider industry. There are currently 17 sets of standards being developed for digital roles, 10 of which are ready for delivery.

In July 2016 the Government published its post-16 Skills Plan, which sets out our intention that digital will be one of the 15 routes across technical education, and that relevant digital skills will be included in all 15 technical education routes where specified by employers as necessary for occupational competence.

The Government has taken significant steps to address the digital skills shortage but we recognise there is more to be done.

Recommendations and responses:

1. *To address immediate gaps, the Government should put in place coherent strategies to address the shortage of skills of particular strategic importance to the UK economy— including cyber-security, big data, the Internet of Things, mobile technology and e-commerce— and how these capabilities should be introduced in workforce training.*

The Government recognises the vital importance of digital skills—from the basic digital skills people need to make the most of being online, to the general digital skills increasingly needed in every job, through to the high-level digital skills for the growing number of specialist digital roles across the economy. Ensuring digital skills keep up to date with the pace of technological change is a challenge for all developed countries and we are taking action across the education and training pipeline to address this.

The Government is working closely with industry to address shortages in areas of strategic importance, including big data and cyber security. The government has committed £1.9 billion over the next five years to improve the UK's cyber security capabilities. A significant proportion is earmarked for skills initiatives to help improve the skills pipeline, including a schools project to develop students with the right aptitude, an apprenticeship project to help critical national infrastructure sectors, and a retraining project to help those looking to change careers and join the cyber security profession.

2. *In order to maximise the opportunities that the digital economy presents, the Government should set out in its forthcoming Digital Strategy a plan for working with businesses to share best practice of, and scale up, existing business-led initiatives to up-skill both employees and customers. These plans should include a framework through which the private sector could collaborate with communities and local authorities to raise digital skills in local SMEs and the wider community.*

The Government agrees that there is a lot of good work taking place in the private sector to up-skill both employees and their customers.

We have been working with a small number of Local Enterprise Partnerships (LEPs) who are business led and well placed to understand local digital skills requirements, to identify common themes where joint working might prove most beneficial, in addition to sharing best practice. We are also developing an initiative in the Northern Powerhouse region with Tech North and other private sector partners to highlight the importance of digital skills and the excellent career opportunities northern tech companies offer.

3. *In its forthcoming Digital Strategy, the Government needs to establish an effective pipeline of individuals with specialist skills in data science, coding and a broader scientific workforce that is equipped with a firm grounding in mathematics, data analysis and computing. The Strategy should commit the Government to annual dynamic mapping*

of public sector and industry initiatives and public spending on digital skills against the economic demand for those skills. This would help it assess the effectiveness of measures that are already in place in addressing the digital skills crisis, and create a long-term mechanism for investment in and adjustment of the Digital Strategy to maximise its effectiveness.

We have introduced a range of measures to ensure the UK is preparing itself for the future demands of digital skills and has an effective pipeline in place across a broad range of digital skills. In the Autumn Statement 2015, the Chancellor announced a new Institute for Coding that will support the development of the high level digital skills that the economy needs. We have also introduced a new computing curriculum—drafted in association with sector experts from the British Computer Society, the Royal Academy of Engineering, Google, Microsoft Research, and several universities—which has been in schools since September 2014. This now provides students with the computational thinking skills that will enable our young people to adapt to emerging technologies. We have also established the Ada National College for Digital Skills, which opened on 5th September 2016. The College will be enrolling students on advanced technical courses to raise excellence in the teaching of higher level digital skills, addressing recognised digital skills gaps, and aiming to reach 5,000 students within the next five years.

Whilst we recognise the importance of ensuring that policy is informed by up-to-date intelligence, the Government does not think that an annual mapping of public sector and industry initiatives will work because digital skills can be acquired across a variety of courses across all subjects including wider STEM subjects, as well as independently online, so any mapping would provide an incomplete picture in a constantly changing environment. We will of course, continue to actively monitor public spending and the scope of public sector work on digital skills activity, informed by the evidence and understanding of skills needs that we gain from our close working with industry partners.

4. *The Government should review the qualifying requirements for the new IT roles added to the Tier 2 visa 'shortage occupation list', making it easier and more flexible for SMEs and startups to recruit top talent from outside the EU.*

The Shortage Occupation List—based on expert advice from the independent Migration Advisory Committee (MAC)—is reviewed regularly and enables employers to recruit workers quickly without the need for a Resident Labour Market Test. The list consists of skilled jobs where there is an identified national shortage that is sensible to fill, at least in part, through immigration.

In its 2015 review, the MAC identified specific shortages relating to startup/scale-up companies, and recommended criteria around the size of the business. To develop the qualifying criteria, the Government consulted a number of organisations representing the digital technology sector. Companies employing fewer than 20 employees may still benefit from the provision if they are working with UK Trade and Investment. If a company does not meet the shortage occupation criteria, they can still sponsor a migrant worker under Tier 2, providing they can show they have first tried to recruit a resident worker. Sponsoring a migrant worker is straightforward and can be done online.

Over 28,000 UK employers are licensed sponsors and there is a reduced application fee for smaller employers. There is also a range of other visa routes that support the digital sector, including the Tech Nation Visa Scheme, operated by Tech City UK as part of the Tier 1 (Exceptional Talent) category.

5. *The Government should step up its Digital Friends initiatives to go beyond its cross-government approach by extending it widely across the public sector.*

The Digital Friends initiative was launched in March 2015 and all government departments were asked to "provide informal or spontaneous [digital skills] support to people inside or outside the workplace" through staff who were encouraged to volunteer as digital friends.

So far, 8 departments are carrying out Digital Friends' activities, and 980 digital friends have been recorded. Government Digital Friends activity varies between departments, and includes initiatives for civil servants to support colleagues to develop digital skills, to host events for local residents to develop digital skills, and to help friends, neighbours and family. We continue to work to encourage all departments to become active in the initiative.

Although the Government is not actively promoting Digital Friends outside central government, a number of our partners and contacts are committed to supporting Digital Friends type activity in their own organisations and others. Most notably:

- Lloyds Banking Group have developed a strong network of 'champions' across their central offices and branches all over the UK. They have developed 'Digital Champion Walls' across the organisation to visualise their colleague's commitment to being digital friends. They also attend events to promote the initiative, send regular newsletters and are mapping volunteering locations for staff to provide digital support. They have 11600 people on board with the initiative, and have trained over 3000 of these.

- The One Digital Consortium, funded by National Lottery, brings together 6 organisations who are developing methods to create a sustainable and effective network of digital champions.

- Good Things Foundation's 'Learn My Way' website helps people to develop their digital skills, and encourages learners to pass on their skills to friends and family as digital champions.

6. *The Government should take into account the recommendations from both the Shadbolt and Wakeham Reviews in the forthcoming Digital Strategy to help deliver the required supply of digital skills for the UK economy. With the opportunity now afforded by the delay in publishing the Digital Strategy, the reviews should be fully embedded in the Strategy.*

We are working with relevant stakeholders and bodies to take forward the key recommendations in Professor Shadbolt's Review of Computer Science Degree Accreditation and Graduate Employability to ensure graduates from Computer Sciences have strengthened employment outcomes. This review, alongside Sir William Wakeham's

Review of STEM Degree Provision and Graduate Employability, called for an increased focus on work experience, 'soft skills', and career planning advice and support to ensure graduates have the technical and professional skills needed by employers.

We know how critical graduates in computer sciences are to the UK economy. The computer science landscape is fast changing and demand for graduates with the right skills is high with employers reporting shortages in specialist technical IT skills: from cyber security to cloud computing, mobile applications to big data. There are already a range of initiatives in train to tackle these shortfalls. These include the establishment of the Institute for Coding, where we want to stimulate innovative collaboration between universities and businesses to drive excellence in the design and delivery of higher level computer science provision. The Government has committed a total of £20 million in capital to assist in funding the Institute for Coding. We are also providing funding to support development of innovative industry-designed computing science degree conversion course pilots, predominantly at postgraduate level. Through this initiative a new stream of graduates with computing science skills in particular demand will be available to industry from summer 2017 onwards.

7. *The Strategy should also include a commitment for the Government to work with the Tech Partnership to develop industry-led, vocationally focussed careers advice in universities that prepares the future workforce for the growth in digital*.

The Government is taking steps towards improving careers advice so that it is better informed by the labour market and by trends in certain sectors—including digital. To do this, as announced in our Post-16 Skills Plan, the Government will make labour market trends and performance of educational programmes available to students, including those in higher education, enabling them to make an informed choice about their career direction based on the destinations and earnings of previous students. This will also ensure education providers are held accountable for the success of their students in progressing into sustainable education or employment, not just gaining qualifications.

8. *The Government should encourage universities to provide 'code conversion courses' to help graduates from non-computer science backgrounds to enter the tech sector with a recognised qualification*.

The Government is already providing funding to support development of innovative industry-designed computing science degree conversion course pilots, predominantly at postgraduate level. The pilots will take place at 9 universities, with students graduating from summer 2017, and we anticipate further institutions will offer additional conversion courses based on successful pilots in due course. These will allow those who have undertaken previous study in other subjects to transition to digital careers in high demand areas, such as data science, cyber security and software development.

9. *We recommend that the Government clarify the full extent of ELQ exemptions for STEM subjects as a matter of urgency. These exemptions should include STEM conversion courses and Digital and STEM Apprenticeships to encourage the use of the Apprenticeship Levy to upskill the existing workforce*.

On 12 August 2016, we published details of the proposed new funding model for apprenticeships to start with the apprenticeship levy in May 2017. These include a proposal that an individual can be funded to undertake an apprenticeship at the same or lower level

than a qualification they already hold, if the apprenticeship will allow the individual to acquire substantive new skills and the content of the training is materially different from any prior training or a previous apprenticeship.

10. *In the period until [the Institute for Apprenticeships] is operational in April 2017, the Government needs to work closely with employers, higher education institutions and schools to understand the apprenticeship marketplace, to ensure that education aligns with industry's requirements needs, and that apprenticeships are delivered in a flexible way to adjust to future changes in the digital sector.*

The Government is continuing to work closely with employers to ensure that the reforms to the apprenticeship system reflect industry needs. There is widespread support for the apprenticeships programme and already demand for Degree Apprenticeships from employers including TfL, Nestle and BAE Systems—and the appetite from Higher Education Institutions is growing. We would like to take this opportunity to highlight that the figures in paragraph 47 of the Government response were based on the number of digital apprenticeships from the Tech Partnership. The Science and Technology Committee has misattributed these as 'digital degree apprenticeships' rather than digital apprenticeships.

The introduction of the Levy and reform of the apprenticeship funding system will also increase employer engagement levels with apprenticeships. Through the new digital service, employers will be given more control of funding for apprenticeships and greater ability to engage directly with providers to negotiate training that meets their needs.

We know that in the digital sector, industry wants to see many higher-level apprenticeships. We have made an £8m Development fund available to help universities and partners build capability and capacity among HE providers to meet employer demand. We are also encouraging universities to work with employers in occupational areas where they already have links, through learning or research. We will continue to do everything we can to encourage strong partnerships between HE and business by encouraging employers to develop and design new Degree Apprenticeships with HE providers and professional bodies.

11. *The Government should emphasise the need for more digital skills components in all apprenticeships, not just 'digital apprenticeships', to gear them to the needs for jobs across the economy. The Government should make digital skills the focus of its 3 million apprenticeship target. It should also work closely with industry, to encourage more women to pursue apprenticeships in the tech industry.*

Employers designing the new apprenticeships will determine the knowledge, skills and behaviours required for their standard, including any appropriate digital skills component.

The Skills Plan, published in July 2016, sets out a commitment to introduce 15 routes, including one in Digital occupations, for students studying in colleges. This will ensure that students on full-time technical courses, as well as those on apprenticeships, gain the skills, knowledge and behaviours valued by employers. The post 16 Skills Plan also sets out that relevant digital skills (alongside English and maths) will be included in all 15 technical education routes where specified by employers as necessary for occupational competence.

Approximately half of all apprentices are female, but we know that more needs to be done to extend the positive gender balance from the whole apprenticeship programme to all sectors. Women are considered in any marketing activity—the female apprentices selected for the 'Get In Go Far' marketing campaign work in a wide variety of sectors including print, software development and project engineering.

12. ***The Government should review its Trailblazer initiative, making it more streamlined and accessible for SMEs. The Government should examine the scope for simplifying the scheme's processes, to encourage business in the technology sector, especially SMEs, to invest in apprenticeships***.

The opportunity to develop new apprenticeship standards is open to employers of all sizes and in all sectors. In order to ensure that the voice of smaller employers is heard in this process, we require any Trailblazer employer group developing a standard to normally include at least two employers with fewer than 50 employees and for the group to consult widely on the apprenticeship before it is finalised, in order to ensure it will meet the needs of all types and size of business that would want to use it. We have also set up a small business travel fund to support small businesses with reasonable travel costs in relation to developing apprenticeship standards. In the context of the establishment of the Institute for Apprenticeships next April, we are also currently looking at ways to streamline the wider apprenticeship development and approvals process.

The funding policy for apprenticeships will change to reflect the introduction of the apprenticeship levy in April 2017. We published proposals for how the new funding policy, which will commence from 1st May 2017, will pay for apprenticeships in England on 12th August 2016, and invited employers and providers to provide feedback on these by 5th September. Our priorities for the new funding policy include for it to be simpler and easier for employers of all sizes to navigate, choose the apprenticeship training they want to purchase and negotiate on price. The proposals simplify the Government contributions towards apprenticeships by bringing together the old frameworks and the new standards into one set of fifteen funding bands. Smaller employers who do not pay the levy will be required to contribute only 10% towards the cost of training, which is significantly less than the 33% trialled as part of the trailblazer. We have also included a specific incentive where Government meets 100% of the cost of training to encourage small non-levy paying employers with fewer than 50 staff to employ 16-18 year old apprentices.

An online estimating tool is available to help employers of all sizes see how the levy and proposed new funding system will work for them.

13. ***The Government must also make it easier for industry to partner with universities and colleges to support student teaching. Industry, universities and schools should also collaborate in promoting work placements in an open and transparent way. This will make it easier for all students to have the opportunity to experience a 'taster' of the industry that may well lead to permanent employment. One way of facilitating such partnerships and collaborations for businesses would be to allow the cost to be written off against Apprenticeship Levy contributions***.

The Government recognises that quality work placements will often be the main way that students in college-based provision can gain practical skills and behaviours required for the workplace. It is for providers, industry and businesses themselves to work together to

ensure people are equipped with the right skills, knowledge, work readiness and education that employers need—including any arrangements for work placements and industry experience for students.

However, Government does have an important role to play in making it easier for industry to partner with universities and colleges to support student teaching. The Shadbolt Review of Computer Science Accreditation and Graduate Employability, and the Council of Professors and Heads of Computing's report into Computing Graduate Employability recognised the importance of work placements and set out a number of practical ways to increase the number of students undertaking work experience and to ensure that students fully understand the wider benefits of work placements. The Government will work with key stakeholders including the CPHC to take forward the Review's recommendation taking account of the CPHC report and other evidence.

Alongside this we would expect industry, universities and schools to collaborate in promoting work placements in an open and transparent way. This will make it easier for all students to have the opportunity to experience a foretaste of the industry that may well lead to permanent employment.

As outlined in the Skills Plan (July 2016), we will see the introduction of a common framework of 15 technical education routes encompassing all employment-based and college-based provision. Every student following a two-year college-based technical education programme will be entitled to a high-quality, structured work placement in their second year. Successful completion of this work placement will be a requirement for full certification at the end of the study programme. We will publish the details of how we will implement these reforms in due course.

In addition, Government also supports key initiatives such as:

- Internship opportunities for unemployed graduates who have recently left education through the BIS funded Graduate Talent Pool (GTP) website. GTP has proved a useful way of encouraging employers, especially small enterprises, to offer graduate internships, and of ensuring that those internship vacancies are available to the widest possible audience of new graduates. GTP is free to employers and to graduates, provides information and advice on all aspects of internships, and includes a quality assurance process for vacancies. Around 98% of vacancies are for paid internships which we actively seek. The service has carried nearly 62,000 vacancies since 2009, and more than 10,800 employers and 112,000 graduates had registered by the end of May 2015.

- To aid business/University engagement, the Government, alongside partner bodies, provided development funding for a National Centre for Universities and Business (NCUB). NCUB gathers evidence, brings together university and business leaders, and shares best practice. It covers all aspects of university/business working, including skill needs, work experience and graduate recruitment. NCUB is a network of the leaders of 64 universities and 52 businesses, brought together with the public funders of science and innovation under the NCUB's big tent approach. NCUB improve decision making in collaboration

and innovation by enabling these leaders to share knowledge in events of which there are 10 a year, but also by providing them with robust evidence to inform their decisions and digital enablers of collaboration.

Regarding the Committee's recommendation about using the apprenticeship levy funding to facilitate greater cooperation between universities, colleges and businesses—we are clear that the apprenticeships budget can only be used to cover the costs of apprentice training and assessment.

14. *The Government should work with the Further Education sector to develop 'Digital Colleges' to replicate the National College for Digital Skills model across the country.*

The National College for Digital Skills opened its doors to students on 5th September 2016, and has growth plans in place to train around 5000 students over the next 5 years. We would expect areas where digital skills are in high demand to work with the National College for Digital Skills to identify potential partnerships in their region, to deliver skills and qualifications that are developed with input from employers and which will offer high quality progression pathways to and from the National College.

15. *The Government has set targets for recruiting teachers in Maths and Physics. They should also make a similar pledge for Computer Science. This would demonstrate a commitment to equip our future generation with the tools and resources to navigate the digital world, and provide a means of monitoring progress.*

We recognise that recruitment of computer science teachers is a challenge. This is why we already have in place generous bursaries and prestigious scholarships for computing, just as we do for maths, chemistry and physics.

For postgraduate Initial Teacher Training (ITT) courses the Government provides tax-free bursaries in order to incentivise more applications. As such, bursaries are generally provided for phases, subjects and routes which have previously struggled to attract sufficient applicants. We review the financial incentives for ITT each year in order to respond to longer-term recruitment patterns. Computing Trainees undertaking ITT in 2017/18 with a first class degree will continue to receive £25,000. Those with a 2:1 or 2:2 will also receive £25,000, an increase of £5,000 on the previous year. However, we always look to respond to recruitment challenges and we continuously review how we can attract the brightest and best to teach computing in schools.

16. *We recommend that the Government request Ofsted to include the computing curriculum in their inspections and require schools to deliver credible, sustainable plans for embedding computing.*

As part of standard 'Section 5' Ofsted school inspections, inspectors make graded judgements on the effectiveness of leadership and management; the quality of teaching, learning and assessment; pupils' personal development, behaviour and welfare; pupils' outcomes; as well as the overall effectiveness of the school.

Although Ofsted does not inspect individual curriculum subjects, all aspects of the curriculum are within scope of school inspections. Inspectors will consider the breadth and balance of the curriculum, and its impact on pupils' outcomes.

Good schools now receive short inspections. These focus primarily on leadership capability and capacity, although all aspects of a school's provision, including the curriculum, remain in scope. There are no plans to introduce a requirement for Ofsted to report specifically on the computer curriculum in schools or schools' plans for embedding computing.

17. T*he Government should encourage the uptake of existing available resources by schools, many of which are free. Learning from the success of existing teacher support initiatives like The Big Write, and working closely with academia and industry, the Government should consider whether developing a similar model for computing will also help address gaps in IT resources.*

The Department for Education has provided funding for the Computing at School (CAS) Barefoot Computing programme which has created resources to help primary teachers with little or no experience in teaching computing to deliver the new curriculum. BT continue to fund Barefoot to run school workshops. We have also provided a £500,000 matched fund for proposals that would have a positive impact on the quality of teaching computing in schools. This has included the development of resources, such as a secondary computing curriculum guidance document produced by the University of Hertfordshire, two hard copies of which has been provided to every secondary school in England.

18. *Furthermore, to ensure digital education in schools continues to keep pace with business needs in an evolving tech environment, we recommend that the Government work with the Tech Partnership to establish a regular forum for employers to raise and discuss their priorities for ensuring the computing curriculum and its teaching stay up to date, and to help ensure that other school subject qualifications provide a foundation for a broader range of digital careers. This forum—which could be attached to the minister-chaired Digital Engagement Council—would also be a springboard for ambitious expansion of industry support to schools, going beyond code clubs (discussed below) to include careers advice, Apprenticeship schemes and work placement programmes.*

The new computing curriculum, introduced in September 2014, was developed in conjunction with sector experts from the British Computer Society, the Royal Academy of Engineering, Google, Microsoft Research and several universities. The new curriculum has avoided undue prescription in order to provide space for teachers to teach their subject in a way which best meets the needs and interests of their pupils. This helps to future-proof the curriculum content by allowing teachers to draw current trends and developments into their subject teaching so that lessons to remain topical and reflect the current computing landscape. There are no plans at this stage to review the curriculum.

The new curriculum has a strong focus on core computing principles. It requires that pupils should be taught how to understand and apply these fundamental principles and concepts, such as abstraction, logic, algorithms and data representation, and the evaluation and application of information technology (including new or unfamiliar technologies) analytically to solve problems. This will support young people throughout their lives in a constantly evolving, and increasingly technologically-driven, environment. Maintained schools need to follow the national curriculum, and it acts as a benchmark for academies.

19. *We recommend that the Government increase its investment in teacher training as a long term commitment and request that, as part of its monitoring of the delivery of the computing curriculum, Ofsted take into account the uptake of free resources and training.*

The Government is already investing heavily in securing high quality teachers; particularly in priority subjects; in the 5 years up to 2020 we will be spending over £1.3bn on attracting and training new teachers—this includes generous financial incentives, such as bursaries and scholarships worth up to £30,000 tax-free, to attract the best trainees in priority subjects, as well as salary grants to support those who want to earn whilst they train to teach.

When judging the leadership and management of a school, inspectors take account of the quality of continuing professional development for teachers at the start and middle of their careers and later.

20. *We commend Teach First and the Master Teachers initiative but, given the rate of loss to a highly attractive private sector, we believe that the ICT streams of these programmes should be scaled up to have any hope of delivering the sheer number of teachers needed for the long term health of UK digital education.*

DfE's support for the Master Teachers/Network of Excellence in Computer Science continues to provide support to ensure teachers are equipped to teach the new computing curriculum and qualifications, and to raise the quality of teaching in computing and computer science across primary and secondary schools and colleges. This work, managed by the British Computer Society, has ensured that there is a national network of over 300 'Master Teachers' whom schools can commission to provide training for their teachers.

High quality teaching is the most important element of a world class education system that closes the door on disadvantage. We want all young people, irrespective of birth and background, to benefit from the best possible teaching. That's why we continue to support the Teach First programme. The Government is committed to encouraging the growth of Teach First, and will continue to support Teach First as it raises standards in some of the most challenging areas of the country.

21. *In its forthcoming Digital Strategy, the Government should review the case for financial incentives for recruiting and retaining computer science teachers in schools, mindful of the higher pay remuneration available in the private sector. As an interim solution to recruitment shortfalls, the Government should consider categorising computer science teachers as one of the 'shortage occupations', thereby making it easier for schools or local authorities to recruit from outside the EU.*

For postgraduate Initial Teacher Training (ITT) courses the government provides tax-free bursaries in order to incentivise more applications. As such, bursaries are generally provided for phases, subjects and routes which have previously struggled to attract sufficient applicants. We review the financial incentives for ITT each year in order to respond to longer-term recruitment patterns. Computing Trainees undertaking ITT in 2017/18 with a first class degree will continue to receive £25,000. Those with a 2:1 or 2:2 will also receive £25,000, an increase of £5,000 on the previous year.

In addition to ITT training bursaries, the government continues to offer scholarships to incentivise more ITT applications in the subjects where they are most needed. In partnership with the BCS, The Chartered Institute for IT, we have recently announced that we are continuing to fund scholarships in computing aimed at the best candidates and worth £27,500, an increase from £25,000 in 2016/17. We always look to respond to recruitment challenges and we continuously review how we can attract the brightest and best to teach computing in schools.

The Migration Advisory Committee (MAC) is currently reviewing the teacher labour market to determine whether there is a shortage which it would be sensible to fill, at least in part, through non-European Economic Area (EEA) migration. This encompasses all teaching subjects, including computer science.

We recognise that recruitment is challenging at the moment. This is why we are focused on attracting more top graduates into the profession, particularly in STEM subjects such as computing.

22. *We have been impressed by the range of innovative and exciting coding and computing clubs and resources offered by industry for schools. Given the pace of innovation, industry will in many cases be best placed to provide the technical underpinning of these initiatives. We believe therefore that it is only common sense that take-up of these clubs and resources should be the norm for schools rather than the exception. It is vital that the Government encourages industry to scale up its involvement in these initiatives, and schools to grasp the opportunities that become available*.

The Government recognises the value that these initiatives can bring and is working closely with industry and relevant stakeholders to raise the profile of initiatives such as these. We will continue to do so.

23. *We recommend that the Government works with the Tech Partnership to raise the ambition for, and coverage of, industry-led digital training, and to make it easier for businesses of all sizes to get involved*.

We already work closely with the Tech Partnership to create and drive policy decisions and direction for digital skills. In May 2016, in response to the recommendations of the Skills Funding Agency Review of Digital Skills Qualifications in Further Education, Government commissioned the Tech Partnership to develop basic digital skills standards. These will provide a clear framework setting out the foundation digital skills required in today's society and workplace. We work closely with various organisations, of all sizes, to address other areas of digital skill needs.

24. *The Government needs to work with employers and educators to better understand and address why female students in schools, colleges and universities do not apply for digital courses and careers. However, the Government also needs to focus on other areas beyond gender—looking at other diverse backgrounds such as disability, ethnicity and disadvantaged socio-economic groups—so that children and young people can have a wide range of role models to inspire them to study and pursue careers in STEM*.

The Government is determined to encourage more young people, especially girls, to study STEM subjects. That is why we recently announced an ambition that by 2020 we would see a 20% increase in the proportion of girls' A level entries in mathematics and science

subjects. Government is already doing much to address this issue. This includes initiatives to recruit more top mathematics and science graduates into teaching and ensure existing teachers have access to high quality professional development through the Network of Teaching Excellence in Computer Science, Science Learning Partnerships and Maths Hubs. We also support the industry-led 'Your Life' campaign that aims to change young people's perceptions of STEM subjects.

The most significant diversity issue in relation to STEM subjects is gender. However, that is not the only underrepresented group in this area. Historically, too many pupils have been discouraged from taking subjects that can be particularly valuable at university and in the economy. At GCSE, we want the vast majority of students to study the EBacc—including subjects such as science and computer science. Disadvantaged students are much less likely to study the EBacc.

We are, of course, taking broader action to improve standards for disadvantaged students. The pupil premium provides schools with additional money to raise standards for disadvantaged pupils. We continue to build on reforms from the last parliament, and when compared to 2010 there are now more than 1.4 million more pupils in good or outstanding schools.

25. *Employers can also actively engage with schools, acting as role models and mentors. Interest in computer science (and STEM) needs to be captured at primary school level, then maintained until key career defining choices are made in selecting subjects at GCSE and A level.*

The Government supports the Committee's view that it is beneficial for employers to engage with schools. We are committing £90m over this Parliament to improve careers advice, which includes further funding for the employer-led Careers & Enterprise Company (CEC) to continue the excellent work it has started, and £20m to increase the number of mentors from the world of work supporting young people at risk of underachieving. The CEC launched its Enterprise Adviser Network (a network of Local Enterprise Partnerships that are coordinating employer volunteers working in schools and colleges) in September 2015, and will continue to roll out the network nationwide to the remaining Local Enterprise Partnerships.

The Government agrees that interest in computer science needs to be stimulated at primary school, which is why computing is a statutory national curriculum subject at all four key stages, teaching children about programming and algorithms. We also support the work of Primary Futures, which aims to raise aspirations and motivate young people to improve their academic performance by arranging for people from a wide range of professions and different backgrounds, including computing, to attend a primary school to help children understand the link between what they learn in schools and the world of work.

We are keen that interest in STEM subjects and computer science is maintained by pupils throughout secondary school, and that pupils and their parents are informed of the benefits of selecting STEM subjects. We support the use of the Gatsby benchmarks in schools career advice, one of which highlights the importance of linking the relevance of STEM subjects with a wide range of career paths. To this end, we encourage the use of STEM

ambassadors in schools, and emphasise the importance to schools of using Labour Market Information to demonstrate to pupils and parents the potential benefits of studying STEM subjects post-16.

26. ***Given the significance of the digital agenda for UK plc and to ensure that the [Digital] Strategy has sufficient weight in Government, and its cross-departmental elements are appropriately joined up, we recommend that the Digital Economy Minister attend Cabinet and a Minister in each relevant department be identified as responsible for delivery of the Government's digital agenda.***

The Secretary of State for Culture, Media and Sport leads the government's work on the digital economy, supported by Matt Hancock as the Minister of State for Digital and Culture. This is increasingly a policy area that impacts on the whole of the Government's agenda, and DCMS works closely with other departments to drive this forward. This has been further strengthened by the recent appointment of Matthew Gould as the Director General for Digital and Media.

Ben Gummer, Minister of State for the Cabinet Office, is responsible for the Government Digital Service, leading on digital transformation within government.

27. ***The Digital Strategy should be published without further delay. It should include benchmarks and defined outcomes that are necessary to measure levels of success and decide on next steps. There should be goals for developing better basic digital skills, for increasing the number and diversity of students studying computer science, for increasing digital apprenticeships and for fostering digital champions, a plan for greater awareness of business-led initiatives, and a framework through which the private sector could more readily play a collaborative role with communities and local authorities in initiatives to raise digital skills in local SMEs.***

We are already among the most digitally connected countries in the world with a globally successful digital economy. Following the decision of the British people to leave the European Union, we have been engaging closely with the digital industries to understand their concerns and priorities, and will continue to do so.

At the Autumn Statement, the Chancellor underlined the Government's continued support for innovation and technology with the announcement of significant new investment in research and development and digital infrastructure. We will continue to work with industry to ensure that our digital and industrial strategies help boost growth and productivity across the country and across the economy.

The Government is working to boost digital skills at all levels and in a range of ways, from basic digital skills through to the advanced skills needed by businesses, to ensure that everyone is able to participate in an increasingly digital economy.