

Public Accounts Committee

Oral evidence: Delivering STEM skills for the economy, HC 691

Wednesday 18 April 2018

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[Watch the meeting](#)

Members present: Meg Hillier (Chair); Bim Afolami; Sir Geoffrey Clifton-Brown; Caroline Flint; Gillian Keegan; Shabana Mahmood; Layla Moran; Anne Marie Morris; Bridget Phillipson; Gareth Snell.

Sir Amyas Morse, Comptroller and Auditor General, Adrian Jenner, Director of Parliamentary Relations, National Audit Office, Sian Jones, Director, NAO, and Marius Gallaher, Alternate Treasury Officer of Accounts, HM Treasury, were in attendance.

Questions 1-148

Witnesses

I: Jonathan Slater, Permanent Secretary, Department for Education, Paul Kett, Director General for Education Standards, Department for Education, Alex Chisholm, Permanent Secretary, Department for Business, Energy and Industrial Strategy, and Professor John Loughhead, Chief Scientific Adviser, Department for Business, Energy and Industrial Strategy.

Report by the Comptroller and Auditor General

Delivering STEM (science, technology, engineering and mathematics) skills for the economy (HC 716)

Examination of witnesses

Witnesses: Jonathan Slater, Paul Kett, Alex Chisholm and Professor John Loughhead.

Q1 Chair: Good afternoon, everybody, and welcome to the Public Accounts Committee on Wednesday 18 April 2018. We are here today to look at the important issue of STEM skills in the economy, and the skills that are needed to help Britain succeed in the world—very pertinent in the light of Brexit. We have a National Audit Office Report in front of us that highlights some of the issues. One of the key things we want to probe today is how Government is getting a grip on what is needed, as well as trying to supply the right skilled workforce for our country.

We are going to go into that in a moment, but before we do, I want to ask you this, Jonathan Slater. In the last week, we have seen Peter Horrocks resign after a vote of no confidence from the Open University. Have you been having any conversations with the Open University about its future role? Is that something that has been engaging you this week?

Jonathan Slater: When the Minister for universities took on his role after the last reshuffle, one of his very first statements was about the importance of the work of the Open University, which is evidenced by the fact that the Department puts more than £40 million a year into the OU in recognition of its important role in the additional cost of, among other things, educating part-time undergraduates and the like. That was why, in recognition of the reduction in part-time numbers, which we discussed at the last meeting of this Committee, we made that an important part of the post-18 review that is going on at the moment. The Government's commitment to the ongoing success of that institution continues following the resignation. We look forward, as much as we did before, to recommendations about what more we can do over and above our plans to give part-time students maintenance loans for the first time from this September, which I mentioned last time.

Q2 Chair: You rightly highlight our session last time. Given that there is a shortage of opportunities for people who want to be part-time students and the Open University needs to make savings of £100 million, is there a likelihood that Government might put more money into the Open University to preserve this important route for alternative education provision for people who are perhaps not three-year full-time students—



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what you might call standard students?

Jonathan Slater: The Government does not have any plans to change the way that it is funding higher education institutions at present; we are waiting for the advice we get from the post-18 review. We have asked them specifically to look at the way that we put specific funding into institutions in particular circumstances and how the student loan system works. We acknowledged some unintended consequences of the implementation of the current tuition fee on part-time learning, so I would not be surprised if the panel came back with recommendations, but we are waiting to hear what they think.

- Q3 **Chair:** Partly in the light of what we discussed last time, do you acknowledge that the Open University has a particularly important role in filling some of the vacancies and making sure we have the trained workforce that we need, because of its ability to reach what you might call non-traditional students? In that light, you have talked about a possibility of a different funding regime, but is there a possibility that you might look closely and work with them to ensure that they are on an even course and not reducing courses and opportunities that might be particularly useful in light of some of the things we will discuss today?

Jonathan Slater: I am probably going to get irritating if I just repeat the things I have said. I haven't really got anything more to say.

- Q4 **Chair:** Remind us when the post-18 review is reporting.

Jonathan Slater: I would expect a report back from the panel later this year.

- Q5 **Chair:** Later this year—that is a great civil service timetable. So presumably you mean before Christmas.

Jonathan Slater: Yes.

Anne Marie Morris: That's the latest.

- Q6 **Chair:** Exactly—I'm trying to narrow it down. So maybe by the autumn?

Jonathan Slater: Equally, they are in the middle of a call for evidence, and they need to think through, on the back of the evidence they have, when they come back to us with what—

- Q7 **Chair:** So the timetable is in their hands.

Jonathan Slater: Indeed it is.

- Q8 **Chair:** That is fair enough. And once you have got it, how long do you think it might take the Department to digest it and come up with proposals?

Jonathan Slater: These questions aren't getting any easier, are they? It would depend on the significance, or otherwise, of what their recommendations are. The Prime Minister make clear—didn't she—her commitment to reviewing post-18 student funding and the policy framework, because she was keen to see what changes should be made. I



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would expect a very significant focus of the Department's efforts on responding as promptly as possible to what the panel recommends, as soon as it recommends it.

Q9 Chair: We know our sister Committee is watching this closely; thank you very much.

Having let Mr Slater come in early, I want to introduce the panel properly. From my left to right, we have: Paul Kett, the director general for education standards at the Department for Education—welcome back to you; Jonathan Slater, the permanent secretary at the Department for Education, and currently one of our frequent flyers; Alex Chisholm, the permanent secretary at the Department for Business, Energy and Industrial Strategy. Last time you came in front of us, Mr Chisholm, you struggled in with a bad back. Are you better now?

Alex Chisholm: That is correct; it is getting better, thank you.

Chair: Getting better. Well, if you need a comfort break, do let us know and we will do our best to divert questions elsewhere for a minute or two.

Jonathan Slater: I've got a real twinge here. *[Laughter.]*

Chair: Sorry; too late. Mr Chisholm is either a very good actor or he got his excuse in a few weeks ago. Then we have Professor John Loughhead, OBE, the chief scientific adviser at the Department for Business, Energy and Industrial Strategy. A very warm welcome to you, Professor Loughhead. I think it is the first time you have appeared in front of this Committee—is that right?

Professor John Loughhead: It is indeed, yes.

Chair: Welcome to you. I will hand over to Gillian Keegan to kick off.

Q10 Gillian Keegan: Mr Chisholm, how critical do you think delivering the STEM skills agenda and getting this right is to our future productivity and economic development as we leave the European Union?

Alex Chisholm: Thank you for the question. The short answer would be: very critical. I think you have probably had a chance to take a look at the industrial strategy White Paper we published in November. You will see within that that, in describing the future course of the economy, we do think that STEM skills are going to be very important in some promising fast-growing sectors such as aerospace or life sciences or renewable energy. Obviously, all of those draw very much on STEM skills.

Overall, the knowledge intensity of the economy is growing and the technology component is growing. As we have seen from lots of different sources, the emphasis on digital skills today is as important as literacy was in former years.

Q11 Gillian Keegan: Yes, I agree. If you get this wrong, what impact will it have on your ability to deliver the industrial strategy?

Alex Chisholm: I think it is really critical, as I say.



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Q12 Gillian Keegan: Will it mean that it completely won't get delivered?

Alex Chisholm: Well, there are lots of elements to the industrial strategy.

Q13 Gillian Keegan: Can you deliver it without skills though?

Alex Chisholm: Without skills, no. It is one of the key foundations.

Q14 Gillian Keegan: So it is actually not just highly critical, but crucial. Without that foundation, would you agree that you would not be able to deliver your industrial strategy?

Alex Chisholm: Yes, we need a skilled workforce, no question.

Q15 Gillian Keegan: Mr Slater, how critical do you think it is to deliver these skills for the future of our economy and solving our productivity puzzle?

Jonathan Slater: Very important indeed. We are working very hard to continue to grow the number of skilled people in STEM subjects as they leave school, college, apprenticeships and higher education.

Q16 Gillian Keegan: So would "very important" be important enough when it is actually one of the key pillars of delivering our future economic success?

Jonathan Slater: No, sorry, we are saying the same thing. Jonathan needs the skills to be generated for the success of his strategy; I am working as hard as I can to secure them.

Q17 Gillian Keegan: Is there anywhere else we are going to get these skills, or are we completely dependent on you and your delivery of these skills to be able to be successful with our industrial strategy?

Jonathan Slater: My contribution is to grow the skills of the workforce in England. Improving the productivity of the country has more aspects to it than that. Clearly, there are a number of ways we can improve productivity, which Alex can speak to. We don't just rely upon the workforce within the country.

Q18 Gillian Keegan: Do you understand how important the workforce is to delivering productivity improvement in today's digital economy?

Jonathan Slater: Absolutely, I can't see anything more important within the work we do in schools, colleges, apprenticeships and HE.

Q19 Gillian Keegan: So we have gone from quite important, very important, highly important to crucial.

Jonathan Slater: I am not seeking to have a conversation with you about adjectives.

Q20 Gillian Keegan: I think it is crucial, from my background of 30 years in tech in international business. I tell you, it is crucial—one of the most crucial things to get right. Bearing in mind that you get what you measure, how comfortable are you feeling that you have the right measures in place to be able to know what it is you are trying solve? I ask that to Mr Slater first.



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Jonathan Slater: How clear are we about measuring the skills we are growing?

- Q21 **Gillian Keegan:** The skills we have, the skills we need and the skills we are growing. How comfortable are you that you have the measures in place to start this process?

Jonathan Slater: We have a lot of good information about the current level of skills and how they have been growing over time. There is inevitably always more that it is useful to have. The NAO Report helpfully identifies some further work that we can do—for example, at its most straightforward, being as clear as possible what we mean by STEM in the first place. I can have a conversation with you today, if it would be useful, about the extent to which the numbers of kids leaving school and college with maths qualifications at level 2 have increased, what has happened at level 3, what has happened at levels 4 to 6, what is going on in apprenticeships, tracking that over time, and forecasting what is going to happen in the future. That is my job to do. It is also my—

- Q22 **Gillian Keegan:** So are you measuring the right thing? I agree there is some great improvement in maths, but are you measuring the right thing, bearing in mind the skills required to deliver the industrial strategy?

Jonathan Slater: What are you thinking of that we might not be measuring?

- Q23 **Gillian Keegan:** Well, you have three levels of measures going on already: from the Royal Academy, EngineeringUK and the NAO, which very helpfully came up with another idea. Maths is one aspect, but there are very many different aspects of digital, science and technology sector-based skills that will be required. Maths is one input to one level. It is great that it is going up, but the skills you need move way beyond maths.

Jonathan Slater: Totally, I just gave that as one example.

- Q24 **Gillian Keegan:** So how are you measuring the skills you need, which are way beyond maths?

Jonathan Slater: I will bring in Paul Kett in a second, if I can, because he is leading the work we are doing on the subjects recommended by the NAO on how to secure a consistent, comprehensive definition of STEM. Currently, we have a lot of data on levels 2, 3 and beyond for each of the component parts of STEM—not for just maths but computer science, engineering, IT, biology, etc. As the NAO has quite rightly pointed out, there is an inconsistency with which different organisations define STEM.

- Q25 **Gillian Keegan:** Did you not know that before?

Jonathan Slater: We did know it before and there was debate that took place with the House of Lords Select Committee back in 2012 about the pros and cons of getting everybody to agree—not just within Government but in organisations well beyond Government—on a consistent definition of STEM. There were debates to and fro about the pros and cons of that. We



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agree with the NAO that seeking a consistent set of definitions would be a good thing to achieve. That is what Paul's cross-departmental group is doing. But it is not just a Government task; it requires collaboration with the Royal Society and others, because we do not own all this stuff. Again, Paul can talk you through that if you find that helpful.

- Q26 **Gillian Keegan:** Six years strikes me as quite a long time to know there is a problem in how you measure it and define it. You mentioned 2012, but in 2018, we are still admiring the same problem.

Jonathan Slater: The Government at the time did not agree with the House of Lords on that point. The good news is that the Department for Education and BEIS agree with the NAO now, and we are cracking on and doing it.

- Q27 **Gillian Keegan:** You have three choices to start with. Which one are you using as a base: the Royal Academy, EngineeringUK, or the NAO? How will you go about defining this and when?

Paul Kett: The work we are doing at the moment is mapping the existing definitions that are used. There are a number of different definitions used by different Government Departments, and even within the Department for Education in different phases of education. We have done that mapping work—it started before the NAO Report but we used that Report as the basis on which to secure agreement that we should adopt a more consistent approach. That mapping work will inform what that consistent approach is. So far, we have identified across those different definitions a very high degree of commonality, but there are some areas where there are differences.

We are now working through whether it makes sense to move to a single definition or whether, as per the NAO recommendation that recognises a single definition is not necessarily the right answer, being really clear about the different definitions of different phases is essential. As a minimum, we will get to that clarity and transparency. Whether we get to a single definition will depend on that mapping work.

- Q28 **Gillian Keegan:** Can I ask a question? The mapping work that is based upon some pre-existing work that has been done is also pre-industrial strategy—yes or no?

Paul Kett: Yes, it will be pre-industrial strategy. I will go on to two further points. First, building on Jonathan's point about working with the sectors, we are working very closely with the Royal Society, who have started a piece of work on mapping existing definitions and also taking account of some of the international comparisons—this is not a problem unique to the United Kingdom and to England. We are aligning our work with that of the Royal Society so we can show that our approach is consistent and engages with industry. That has been welcomed by the Royal Society and others.

Secondly, whatever work we do, one of the other commitments that we recognise we need to make in response to some of the NAO work is about being clear what we mean by STEM in a particular set of circumstances.



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Although we talk about STEM often in its broader sense, actually, our initiatives may well be focused on particular elements within STEM. The example that you gave in relation to mathematics is a good example of that in the schools system, where we have really prioritised mathematics, and also physics, as areas where we were underperforming.

- Q29 **Gillian Keegan:** I'm glad you mentioned international comparisons. Apart from the Royal Society, which probably is a little academic as a delivery vehicle, how else are you going about getting international comparisons? I ask because one of the greatest examples of an economy being turned around, dependent on high-tech R&D, is Taiwan. How are you looking at where we will be competing for global talent?

Paul Kett: We have established in the Department for Education a small team that did not exist until last summer.

- Q30 **Gillian Keegan:** What skill sets do they have?

Paul Kett: I know you mentioned that the Royal Society was perhaps rather academic, but we had a secondee from the Royal Society as part of that team, as one example, and we have drawn in skills from across the Department.

- Q31 **Gillian Keegan:** Are there any with STEM skills or a tech background themselves?

Paul Kett: Certainly with STEM skills; I am not sure about tech backgrounds, but I know within the civil service we are certainly making use of the STEM skills we have in the Department.

- Q32 **Bim Afolami:** Professor Loughhead, you should sing for your supper too. Based on your work and extensive experience, what do you think is the true nature of the problem we face from a commercial perspective—that is, the skills that business needs?

Professor John Loughhead: Could I answer that in two parts? There is undoubtedly always a shortage of what I would term leading edge, high-tech skills for high-tech businesses. Partly that is because the technology is being pushed ahead by the activities of businesses, and therefore the provision of suitably skilled people at the level you would like them at any given point in time will always lag a little behind them. I would like to put the second answer to the question back into the more traditional industrial background where many companies that are currently engaged in well-known activities and have been with us for decades are gradually upskilling. A random example might be in the automobile industry, where the cars we sell today in principle are exactly the same as the cars we sold 40 years ago, but if you look at the core technology it has gone into IT, control systems and sensors to a degree that was not there before.

There is, secondly, a level of penetration of suitable skills through into those traditional industries. My judgment, both here in the UK and as someone who spent 12 years working in France in an established industrial sector, is that the problems we see are identical in the two countries. That is, as the technology front rolls forward, there is a need to change the



profile of the workforce. The recognition of that changing profile becomes apparent as the change happens, and therefore the provision often lags a little bit.

Can I just add one more thing? Consequently, you will see in most established industries a significant effort to increase the skill levels of the people they have, from a basic level where they may well have STEM education, to provide the new specialised skills that they are adapting.

- Q33 **Bim Afolami:** Bearing that in mind, how useful do you think it really is to spend hours or days with teams, trying to define something as broad as STEM? How useful do you think this exercise actually is? Is it possible that, beyond a labelling exercise, what is really important is that we have a laser-like focus, every single year, on what skills we actually need?

Professor John Loughhead: I believe my last answer started to address that. The reality of most people's career in the STEM area is that by the time they get towards the end of it, they will be doing rather different things from what they started out doing. There are basic enabling skills that are covered by the STEM agenda—the mathematics, the physics, the chemistry and many of the other things—that give you the basic capability to adapt to that.

- Q34 **Bim Afolami:** If that is true, it should be quite an easy problem to solve, no? Why is it proving so hard?

Professor John Loughhead: I am not sure that what I have just described is the problem that people have been addressing. There is a question about numbers. There is a question about a precise profile, matching the needs of the moment. Here, we are talking about people who started the process maybe seven or more years previously, so there will always be a degree of lag. Then there is the fact that I mentioned earlier: as one progresses, the skills needed emerge from the process. Therefore the needs, sometimes, are quite recent needs that we are attempting to fill with people who have gone through quite a long educational process. The most important thing is the provision of those basic enabling skills. There we have identified for years—not only here but in other countries, because it is not only us who have this problem—that the number of people going into that area is not as great as we would like.

Alex Chisholm: I will add a few comments, if I may, on the question of why we cannot match more perfectly the supply of and demand for STEM skills. If we go back a bit, to 2004, when there was a big attempt to forecast the future needs of the economy for STEM, targets were set for how many physicists, chemists and mathematicians we wanted. I was interested to read back and see that, on the whole, we actually shot through those targets—that is, we over-supplied; we did much better than expected. But we still have a shortage, so that tells you something has been happening in our economy and other economies around the world: the demand for these skills has been growing much faster than people had expected.



Another point, which is very relevant to the UK, is that we have what is historically a very low level of unemployment at the moment. As the MAC—Migration Advisory Committee—interim report in March says, in the words of the chairman, this is “a good thing”, in that if we had a lot of unemployment, that would obviously be easier for the employers’ side of it. It is now quite a tight market. When they do research—the NAO Report rightly refers to research from EngineeringUK, the Social Market Foundation, the CBI, techUK and so on—often the employers are reporting back that there is quite a tight market for STEM skills, but that is not, overall, a bad thing, as long as we don’t suffer excessive imbalances.

Also, the NAO Report, if I may quote it directly, says on page 7: “Existing evidence indicates that there is a STEM skills mismatch rather than a simple shortage.” I think that is a very judicious remark: that is what the overall picture shows at the moment. But clearly, by the end of this year, when the DFE have completed and published their employer skills survey and we also have the beginnings of the feedback from the skills advisory panels, we will have a much more detailed and nuanced picture of overall supply and demand.

- Q35 Layla Moran:** I visited Harwell last week, and they were adamant that they just could not, for love nor money, get design engineers. They suggested that actually the problem was that Government didn’t have a good grip on what specific types of engineering they needed in order to deliver what are very often Government projects that they have been funded to do. Mr Loughhead, is that something you recognise?

Professor John Loughhead: I recognise the shortage of design engineers and I think you could repeat that story many times in many areas. I think a shortage of design engineers for Culham specifically—

Layla Moran: It wasn’t Culham.

Professor John Loughhead: Sorry, I thought—

Layla Moran: No, it was RAL Space.

Professor John Loughhead: Oh, it was Harwell; okay. On a shortage of design engineers in that space, I cannot comment directly: I have not spoken to them about it. Many of those areas might require quite specific skills, and it may be that that they are looking at. But I think that to say that Government has not identified that that organisation would need those skills x years in the future is probably a little misleading. The question that one would ask is this: as the need for those skills develops, what can be done to put in place the processes to take from what I would call the broadly based material that you’ve got—people with engineering skills—and equip them to fulfil those specific roles?

- Q36 Layla Moran:** But design engineering is not a new type of engineering; it is actually very old. Harwell’s assessment was that this was caused by the demise of manufacturing in the ’80s and that is why it doesn’t exist any more. The question to Mr Chisholm is off the back of that. Do you feel that the MAC is doing its job quickly enough? I ask that because what



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they cannot do, they tell me, is to recruit anyone from the outside. They have a public sector pay cap as well, and they cannot pay above the £55,000 needed to get the visa that they need, so they have to wait to recruit until the next round of visas come on board. Is that something you recognise as a problem?

Alex Chisholm: You will appreciate that the system of managing visas is the responsibility of the Home Office, not my Department, but certainly—

Q37 **Layla Moran:** But do you recognise that problem? Is it something that worries you?

Chair: Mr Chisholm, you cannot dodge the question. That is an important part of the mix, isn't it?

Alex Chisholm: Absolutely, and the Home Office do publish a shortage occupation list, which actually includes design engineers. There are yearly targets and monthly targets, and sometimes people do find they hit the top of the monetary allowances, and that is a constraint. I think in January of this year the Home Office did increase the number of visas available for tier 1 people, and the MAC have certainly been asked to address that question—

Chair: We should say that the MAC is the Migration Advisory Committee, for anyone following.

Alex Chisholm: The Migration Advisory Committee intend to do that in their September report.

Q38 **Layla Moran:** Do you also recognise that the job titles often don't fit with what they actually need, because things are changing so quickly? So actually having a list of job titles is often not helpful.

Alex Chisholm: It is indicative. It is hard to be very precise, as people give themselves lots of different job titles. I once met someone working for Microsoft who was an "internet evangelist". I don't think that appears on the shortage occupation list at the Home Office.

Q39 **Chair:** Is this something that you are trying to get the Home Office to understand? One of the challenges for the MAC is how they match needs for jobs that don't have titles with the skills gap.

Alex Chisholm: Absolutely, and also trying to make sure you take a forward view of that.

Q40 **Chair:** What are you doing precisely?

Alex Chisholm: One thing that is extremely helpful is that the commission given to the MAC includes the need for them to take a view of the alignment of the current market with the future needs of the industrial strategy. That will be part of their report in September. I am actually meeting with the MAC on Friday. We work closely with them to try to make sure that they have the best evidence available to them.

Q41 **Layla Moran:** How does Harwell feed into this? Through you? They



weren't sure.

Alex Chisholm: The MAC have received over 400 responses to date. If Harwell haven't been one of those, they should add their name to the list. It is a public consultation.

- Q42 **Gillian Keegan:** Moving on from Ms Moran's point, what concerns me is that I could say exactly the same thing about 50 businesses that I have spoken to in many different sectors. The core problem is actually obvious on this panel. You say sciences and maths, which is an important element, but they are not the future skills that will drive the industrial strategy and our differentiation.

What are you doing? You have got rid of all the skills boards that you had. What are you doing to make sure that you learn from businesses what they need? They have a future view. They could give you lists. The NAO has had a go here. That is the answer. What are you doing to provide that answer?

Jonathan Slater: We are training at all levels—from primary to secondary and through to adult education—as many people as we can persuade to take advantage of each of the different component parts of the STEM subjects. That is what we are seeking to do. We are not trying to second-guess what the needs of the economy will be in Harwell in 10 years' time. That is not our role. Our role is to increase the supply into the labour market of not just mathematicians, as you say, but each of the different component parts of the STEM agenda. We need to make sure that the curriculum—

- Q43 **Gillian Keegan:** The Report focuses on post-16, so let's focus on that. In fact, let's really focus on 18 through to the workplace, which is where you take these core skills and make them into something that is going to improve the economic development and solve the productivity puzzle. Let's just focus on that. What are you doing to make sure you have got the right things for business?

Jonathan Slater: It starts with apprenticeships, where we are putting in place—

Gillian Keegan: That is not very encouraging, is it? Look at apprenticeship starts.

Chair: Page 29, figure 7.

- Q44 **Gillian Keegan:** Apprenticeship starts in engineering and manufacturing technologies and construction are slightly ticking up, but the ones that are critical to delivering our industrial strategy and our future economic competitiveness—ICT, science and maths—are going nowhere.

Jonathan Slater: I was seeking to answer your question about what we are doing about it.

- Q45 **Gillian Keegan:** You answered that; you said apprenticeships. I would say: no, you are not.

Chair: Let us see if Mr Slater can answer.

Jonathan Slater: You are rightly drawing to our attention the fact that between 2015-16 and 2016-17, the number of science and mathematics apprenticeships fell from 500 to 300—absolutely. What are we doing about that? We are putting in place apprenticeship standards to meet the needs of employers in the future. That is unlike the previous apprenticeship regime, in which the standards that were set for the training that should be done were not set by employers, and where apprentices didn't have to do one day a week of training off site as part of their apprenticeship.

What we put into place from 1 April 2017, at the end of that dataset, to try to turn the story was a new apprenticeship regime in which standards were set by employers with a minimum training requirement. What we did was to say that for all of those STEM apprenticeships there should be an extra cost in securing their delivery.

The average apprenticeship is costing about twice as much to deliver from the previous regime in the data that you are looking at, because we are looking for a much higher quality product—one that is defined by employers. If it is a STEM apprenticeship, in particular, we are saying that at level 2 we will pay an extra 40% and at level 3 we will pay an extra 80%, so that we can incentivise a significant turnaround in those numbers, which, as you say, are not very good.

Q46 **Gillian Keegan:** No. I have spoken to a number of businesses about this new model, which of course everybody is engaged with. The core problem, linking back to being successful in delivering skills for the industrial strategy, is the length of time it takes for businesses to get these standards agreed and the processes they have to go through. That is common. What you are not doing is keeping up with the demand—the 300 that are waiting to be classified, which are all the new skills. Do you have enough resources to do this, to keep up the pace with business?

Jonathan Slater: There are more than 280 new standards in place, running above the trajectory that the Department has—

Q47 **Gillian Keegan:** How many are waiting to be put in place?

Jonathan Slater: Of those, 141 are STEM. We are particularly trying to focus our efforts on STEM. It is absolutely true, as you say, that not all of the standards have come through as quickly as we had hoped. There are more to come, precisely because it is critical that the standards are set by employers to meet their needs.

Surprise, surprise—different employers have got different needs. The task that the Institute for Apprenticeships have been given is to seek agreement, subject by subject, and it is taking longer than they thought. They have accepted that in some cases their systems were not as efficient as they should be, and they have worked hard with businesses to speed up that process. That is where we have got to so far.

Gillian Keegan: I think the complaint about efficiency is actually that the



common denominator is more likely within your Department or within the Institute for Apprenticeships.

- Q48 **Caroline Flint:** On apprenticeships, I listened closely to what you said, Mr Slater, about employers setting the standards. Does it worry you that a recent report by the think-tank Reform found that almost 40% of the 250-plus apprenticeship standards approved since 2012 do not reach the international or historical definition of an apprenticeship?

Jonathan Slater: The changes that we brought into place were in April 2017, so the author of the report is focusing primarily on the framework regime that applied, as you say, from 2012 onwards. The step change that we brought into place in April '17, which has been going for 12 months, moves from frameworks to standards, with a completely new bar at a much higher level of requirement than was placed hitherto. So, I would accept the challenge as regards the previous system, but not as regards the current one.

- Q49 **Caroline Flint:** Just out of interest, officials and the Departments concerned would obviously have had some ownership of the previous framework that was established, which was changed in 2017. What was so illuminating to change it in 2017 that was not there in 2012?

Jonathan Slater: The Government at the time commissioned a review of the previous apprenticeship regime back in 2012—the Richard review—which looked at how well the current regime at the time was going, and identified that there was not anything like sufficient focus on quality or sufficient ownership by employers. So, the reforms of the sort that I have described—I can go into more detail if you like—were designed to put that right. The Departments—BIS, and then we inherited it at DFE 18 months ago—have been working hard to put that regime into place from April '17, and that is what we have done.

- Q50 **Caroline Flint:** An increasing number of reports and evidence indicate that at one end, a number of apprenticeships are listed as including serving food at restaurants and working on hotel receptions. At the other end—I read a report just the other day; I think it might have been in *The Sunday Times*, although I'm not quite sure about that—some employer organisations are badging MBAs that they put their managers on as apprenticeships, in order to use the money for that. Does that worry you?

Jonathan Slater: It is true that employers are able to have apprenticeships both at the level 2 end of the spectrum and in respect of management. There is nothing wrong with an apprenticeship in management for people, either when they are young or when they are older. There is nothing wrong with that in principle.

- Q51 **Caroline Flint:** But why would you call serving food in a restaurant or working on a hotel reception an apprenticeship? Training is needed for those type of jobs, but to my mind and with no offence to anyone working in those areas—those are valuable jobs—they are not what I believe an apprenticeship label should be attached to. I don't think the public think so either. Neither, for that matter, is a manager doing an



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MBA.

Jonathan Slater: It is important to make sure that anybody who is doing an apprenticeship is doing a real apprenticeship, with a day's training off site. Of course, the training that somebody is doing can be relevant to both the task they are doing today and the task they will be doing next. Equally, we and all other countries offer apprenticeships in management as well—there is nothing unusual about that. The author of the report is right to say that the previous regime was one in which you could get away with things that you shouldn't really have been able to. My task is to make sure that that happens much less, and preferably not at all, in the current regime. We will have to see how we do on that. Ofsted will be playing the role that it has always played in assessing quality. We discussed at a previous hearing—

Q52 **Caroline Flint:** The problem is, Mr Slater, that it sounds once again as though Government are behind the curve of unintended consequences, with employers potentially holding on to money, rather than putting it into the pot of the levy, and badging existing training schemes that they should be doing with staff in these areas as apprenticeships.

May I move on to something else? At a previous sitting of this Committee, when we were looking at apprenticeships, I and other colleagues asked a question about gender disparity. Why, when it comes to the roll-out of apprenticeships, is there not a target—or, if you like, a success plan—to ensure that the new generation of apprenticeships does not copy previous generations in terms of gender job segregation? That is very important in the STEM area. Will you explain to me, then, why on page 28 of the Report, in paragraph 3.8, it says clearly that, “there is a clear gender disparity, with females making up around 8% of STEM apprenticeship starts in 2016/17 despite representing over 50% of apprenticeship starts in total”?

Jonathan Slater: That is a very good explanation of the nature of the challenge that we face in making the new system work better. I absolutely remember the hearing in which you put to me the case for setting more ambitious objectives than the previous regime had. The sorts of things that we have been doing since then include working with a group of apprenticeship ambassadors, with a particular focus on increasing diversity, who have been working with large employers—

Q53 **Caroline Flint:** No—hang on a second. You told us about diversity last time, which I have no problem with. I think there were two particular groups, of those from an ethnic minority community and those with learning disabilities—

Jonathan Slater: I was going to talk about women, if you wanted me to.

Chair: You touched on that in the Treasury minute.

Caroline Flint: But what you did not touch on was why, on such a big programme, you didn't set out an expectation that we would start challenging gender job segregation by making sure that those people vying for apprenticeship money should be showing how they are, in a very



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active way, seeking to recruit young women on to these schemes. It is not that there aren't these young women out there with maths and other skills; it is just that they are not being encouraged to go into these sectors.

Jonathan Slater: Absolutely. I am very keen that as we put this new regime in place, we tackle that issue. It is absolutely vital that we do so. I was going to say what I have been doing since the last meeting to address that specific point. The Conservative manifesto set the 3 million target. The Prime Minister set the BAME target. As the permanent secretary for the Department for Education, I am seeing to what extent we can increase the number of women doing STEM apprenticeships. The way we do that is through the apprentice ambassador diversity network, which works with individual employers to agree with them, employer by employer, targets to improve and increase the proportion of women apprentices. For example, we have agreed with Balfour Beatty and Siemens that each of them will increase the number of female apprentices they have in the current year to 20%. That is still only 20%, but it is a move in the right direction and I hope that we will be able to do more of that over time.

Q54 **Caroline Flint:** I have dealt with Siemens on the energy portfolio, and I think they do quite a lot of work in this area. I am worried about whether they are the low-hanging fruit, while lots of other businesses—perhaps smaller than those organisations—aren't even attempting to reach out to young women about going on to these schemes. That is as much about their marketing of these opportunities as it is about the culture in which young men and women work, because there are young women out there with the qualifications, but they are just not being encouraged in. Balfour Beatty and Siemens are at one end, but then you have a whole load of other employers that need to be expected to reach those sorts of standards as well.

Jonathan Slater: I couldn't agree with you more. I was just giving two examples of what we have done with that network.

Q55 **Caroline Flint:** But what you haven't done—this was the request from last time—is to explain why success measures and targets have not been identified across the board in terms of some of these areas where women are not represented—and, for that matter, in terms of young men going into areas where they are not represented as much either. There has not been an effort to go back into the Department and re-look at whether there needs to be a wider measure of success or targets across the board for young women to go into these apprenticeships that they are pretty much excluded from, which excludes them from the workforce they want to work in down the road. You haven't done that, have you?

Jonathan Slater: The Government have not set a numerical target for the number of women apprentices—

Q56 **Caroline Flint:** And there has been no advice to the Government that maybe they should be looking at that.



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Jonathan Slater: The question of policy advice from officials to Ministers is beyond the scope of this Committee.

- Q57 **Chair:** Mr Slater, in your Treasury minute response from October, you talked about monitoring the rate of female participation across all sectors to understand the impact that actions are having on gender disparity. Can you give a sentence in response to the points that Ms Flint and others raised? What are you actually doing?

Jonathan Slater: What we are actually doing is seeking to increase the number of women STEM apprentices, sector by sector and employer by employer. We have managed to achieve an 18% increase in the number of women doing science and maths A-levels over the last seven years. Can we do the same with apprenticeships? I very much hope so.

- Q58 **Chair:** When we look at that Treasury minute response that you will monitor this, what are you hoping will be the practical outcomes of that monitoring? You will see an increase—obviously, you are hoping for that. Monitoring itself is not enough, is it?

Jonathan Slater: No; improvement is what we aim to achieve. Just as we have managed to do at GCSEs and A-levels, we very much hope and anticipate that we will be able to do that with apprenticeships, too.

- Q59 **Bim Afolami:** Do you think, Mr Slater, that too many students are studying biological sciences?

Jonathan Slater: I do not think it is for me, as the permanent secretary of the Department for Education, to set a number for the number of students who should be studying any particular subject.

- Q60 **Bim Afolami:** Okay. Let me ask that in a different way. Let us assume that it was deemed that as part of all the mix of STEM subjects that we have spoken a lot about this afternoon, there is a generally agreed assessment made that we are proportionately seeing too many people going into biological sciences, whereas we would almost rather like to prod some of those young people into certain other areas of STEM. Do you think it is the Government's job to try to do that prodding?

Jonathan Slater: I will bring Paul in to complement this, but what we do is provide a whole series of incentives designed to increase the number of people choosing maths, computer science and physics. As we discussed at the last meeting with the Committee, we lay out in a lot of detail the future earnings of people, subject by subject and institution by institution, so that anybody considering whether they want to do biology or physics will know that on average somebody with a biology degree will earn less money than somebody with a physics degree. It is then a matter for the individual candidates as to which they want to do. We provide incentives, quite apart from the fact that the economy provides them with incentives, because on average they will get a better paid job if they do physics rather than biology. However, I don't think my role goes beyond that.

Paul Kett: I was just going to add, in relation to the school system, we have seen some success at A-level, but it is still an area where we get



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drop-off, particularly of female students not choosing to do physics, for example. We have invested in programmes to inspire more people to choose to do physics, because we recognise that that is an area where there is a drop-off.

We are also very taken, particularly on gender, with some of the research done by the Wellcome Trust and others around why females choose to opt out of subjects and what the factors behind that are. One links to their view of what the workplaces might be like. The work that we do for our careers strategy tries to challenge those perceptions and so on.

There are a number of areas where we are trying to make sure that it is not perceptions that are getting in the way of those choices—so, enabling 16-year-olds to make the right choices for them, away from those perceptions.

Chair: We are going to come back to careers and schools in a moment. I will bring in Sir Geoffrey Clifton-Brown and then Gillian Keegan.

- Q61 Sir Geoffrey Clifton-Brown:** Paragraph 3.8 of the Report makes it quite clear that women make up over 50% of all apprenticeships, yet only 8% do STEM subjects. Those are pretty shocking statistics. What are you actually doing about that?

Jonathan Slater: The challenge of tackling the sexism and stereotyping that girls and young women are on the receiving end of and low confidence among them on STEM subjects is a big deal. It is demonstrated in lots of different ways, one of which we were discussing a few minutes ago, which is the extent to which girls and young women are more likely to choose biology than, as a number of Committee members have chosen, physics, and why they typically don't do STEM apprenticeships.

This is not an England problem. Actually, the level of gender differentiation is less in England than across the OECD as a whole, but it is bad. It is terrible. This is a fantastic opportunity for us to make a significant improvement. We are working with individual employers to agree with them specific targets that they can achieve—of the sort I referred to with Caroline Flint a few minutes ago—to do better, and seeking to spread that practice to others and to go further and further.

It is also about how we change what happens with employers in the way they work as a whole. The introduction of the gender pay gap throws a light on the differential pay between men and women at particular grades in organisations like STEM employers, doesn't it?

The purpose of that reform, which I spent the last year implementing, was designed, in throwing a light on it, to encourage and incentivise employers to tackle the issue. After all, apprenticeships are jobs, so the better they tackle that issue, the more we can pull people through. There are a number of ways in which we need to tackle this issue.

- Q62 Sir Geoffrey Clifton-Brown:** Mr Slater, I wonder whether you are actually looking at this through the right end of the telescope, and



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whether it is not actually much earlier in the education system that we need to tackle that. If you look at figure 6 on page 27, this is not a new problem. Those statistics on the number of women taking up apprenticeships have not moved since 2011-12. This is not a new problem. What are the Government finally doing to differently now that they haven't done over the last six or seven years?

Jonathan Slater: Each of the things that I described are things we have done for the first time in the last year. As you say, this starts at an earlier stage in the system as well. It is a combination of the extent to which girls and young women make active choices and the extent to which employers provide them with those opportunities. This comes from both angles, doesn't it?

We have had some significant successes in increasing the number of girls taking STEM subjects in school. We need to continue to make progress there, and we need employers to play the more expansive role that I was discussing with Caroline Flint.

Sir Geoffrey Clifton-Brown: I'll come back to girls in schools; other Committee members want to ask questions.

Q63 **Gillian Keegan:** Just so you understand how glacial your progress is or how ineffective your strategies are, I did a manufacturing apprenticeship 30 years ago and girls accounted for 20% then. That was 30 years ago, before any of your strategies kicked in. This is a fast-moving environment. If you pick up any industrial strategy from any industry sector, you will see global talent as the number one thing they need. You are in a race and you don't seem to have started it. What are you doing to speed up the progress of some of these well-known issues?

Jonathan Slater: Do you want to carry on talking about apprentices or shall we talk about another one?

Chair: Apprenticeships, I think.

Jonathan Slater: You were describing the world as it was in 2016-17. The question is whether we can make it any better under the new regime. I have been working hard since I took on responsibility for this 18 months ago to see if we can make this system work much better than what went on before.

The fact that I am referring to the cultural issues that transcend apprenticeships specifically should not be taken as any sign of a lack of energy on my part to tackle this issue with all of my energy. The sort of things we are doing in the Department are the sort I saw for myself a couple of months ago in a school in Camden. That work started at 11 years old, ensuring that all girls, as well as all boys, were doing engineering from the age of 11 all the way through, supported by STEM ambassadors, funded by Alex's Department, with women coming in from industry to excite and energise.

Q64 **Gillian Keegan:** I accept there are some good individual initiatives and



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that is what you talk about. But we are talking about a strategy across the country. Flat lines do not normally indicate energy.

Jonathan Slater: So, you are describing the position of the past six years. The question is, can we turn it round now? That is the challenge, isn't it? I am talking about what we have been trying to do in the past 12 months since that five-year flat line. I am not saying it will turn around immediately; I would be foolish to do so. I am describing all the things we are seeking to do to turn it upwards. I am saying we have success in other fields: the 18% increase in the number of girls doing science A-levels, as well as maths A-levels, demonstrates that you can turn the thing round. When I was at school, maths A-level was a subject for losers; now it is the most popular subject. We can turn this round.

Q65 **Bim Afolami:** Can I ask? Did you do maths A-level?

Jonathan Slater: I did.

Chair: We will pause at that and leave people to draw their own conclusions.

Q66 **Caroline Flint:** My concern is the lack of foresight and the level of complacency. Although you are relatively new in the job, experts put together the whole apprenticeship scheme and the framework for it. In the Treasury minute answer to us from the Department, it says, "We have not identified a programme-wide success measure focussed on gender as, overall, women have accounted for the majority of apprenticeship starts in recent years (53% in 2015/16, while they make up 48% of the working population)."

The fact that that sentence is there in the response shows complacency because you are not probing into what is happening within that 53%. It is like, tick, 50% of the starts are women, same old, same old, with no real appreciation of where those women are ending up. For all I know, they are the ones who are being badged on apprenticeships that are serving the food and working on hotel receptions. There is no real sense of the huge opportunity here really to start making a difference down the road.

How can you, Mr Slater, keep saying, "Well, we're looking at this now, in 2016-17, to try to change the programme," when a huge amount of public money has already gone into it—and possibly a huge amount of money has been wasted—and when opportunities have been limited as a result of not getting this right in the first place with this major Government instrument that tries to ensure that we have the workforce for the future?

Jonathan Slater: I think the Government recognised that something was not working in the previous apprenticeship regime. The way the previous system worked, right through—

Q67 **Caroline Flint:** When you talk about the previous regime, are you talking about the one that started in 2012?

Jonathan Slater: It didn't start in 2012. It finished at the end of 2016-17. So, those last five years' flat-lining numbers that you have been



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looking at were under the previous regime, which ended on 31 March 2017.

Caroline Flint: When did that previous regime start?

Gillian Keegan: In 2012-13, according to this.

Caroline Flint: That's what I thought.

Gillian Keegan: Maybe one year earlier.

Q68 **Caroline Flint:** So, let's just say five, six, seven years ago, the Government wanted an apprenticeship strategy. I think everyone supported that. I have to say I thought they made an interesting move in having an apprenticeship levy; I thought that was a good idea. Everybody got together and said, "How do we make this work?" They must have said, "Where are the shortages? Where can we ensure that those people who are not coming into this area should be?" That could be from an ethnic minority background or, in this case, I am particularly talking about women, who of course could be from an ethnic minority background as well.

The powers that be, the best minds across Government, consulting outside Government, got together to develop a scheme, and within five years, six years, seven years had to turn it on its head because it is not doing the job it was meant to do.

Jonathan Slater: It started 12 months ago. The new regime started on 1 April 2017.

Chair: So would you acknowledge what Ms Flint—

Jonathan Slater: When the Government introduced that new regime on 1 April 2017—12 months ago—in doing so, it acknowledged that there were significant downsides in the previous regime in which taxpayers' money went directly to training providers to sell whatever services they wanted to employers, free. Yes, that was a system that wasted a significant amount of money.

Caroline Flint: So you are not—

Jonathan Slater: This system, which came into place 12 months ago, seeks to put employers in the driving seat and ensure that they are setting the standards. Our role is to ensure that quality is achieved and, absolutely, to tackle—not at the macro level where, as you say, 50% of apprenticeships are done by women—but at the specific level that significantly more than 8% of the STEM apprenticeships are female. I am working very hard to achieve that.

Q69 **Chair:** So, what would success look like? When you come back in front of us in, say, six or seven years' time—*[Laughter.]* You will have had your knighthood and gone by then. Let's say six or seven years, because that is what we have been looking at backwards. What would you expect to see as a success?



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Jonathan Slater: I would expect to see significant improvement. It may be frustrating, but as the Committee knows it is literally above my pay grade to set Government targets, to determine which should be set and which should not. I have been set a clear objective by Ministers to work as hard as I can with employers to significantly improve these numbers and I am absolutely up for any advice on how best to do so.

Chair: We will come back to some of those but I want to bring in Layla Moran.

Q70 **Layla Moran:** Mr Chisholm first, and then Mr Slater. Is not the nub of the issue the fact that the two Departments are not sufficiently working hand in glove? Is that not the issue, Mr Chisholm?

Alex Chisholm: I do not think so, no. I think the business community have given a great deal of feedback to the Department for Education, so there is no need for them to speak through us to DFE. DFE are constantly consulting and working with employers on their needs, and have made a lot of changes already to the scheme in the light of that feedback.

Q71 **Layla Moran:** Mr Slater, you said earlier that you are not responsible for delivering bits of the industrial strategy. Maybe I misunderstood what you said but I just want some clarity. What exactly—

Jonathan Slater: My job—

Layla Moran: Let me finish my question. What exactly is the Department for Education responsible for in delivering the STEM skill gap strategies that we see? What exactly are the responsibilities?

Jonathan Slater: Yes. Our job is to play whatever role Government can play in increasing the STEM skills supply at every level in the system.

Q72 **Layla Moran:** Right. You have a specific taskforce that does that. Am I right?

Chair: I think Mr Kett is that.

Layla Moran: That is Mr Kett. Do you have more people, Mr Kett, or is it just you?

Paul Kett: I chair a cross-Government group that looks at STEM skills in the round. So, that brings together colleagues from Alex's Department but also a number of other Government Departments, which ensures that our efforts collectively add up to enable us to deliver the ambition set out in the industrial strategy, but also other aspirations, for example, in terms of improving participation and standards in the education system more generally.

We are working together across Government to do that. We are clear, as per Jonathan's and Alex's responses, that there are clear roles and responsibilities for those Departments but we cannot do it without working together. If I could give one small example, it would be around some of the inspiration work.



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We know in schools that we need to ensure that there are high-quality opportunities for the students to engage with role models, particularly in the STEM industry. Alex's Department provides the STEM ambassador programme, which provides a significant number of volunteers from those industries that schools can then access. That is an example of where we are collaborating.

- Q73 **Layla Moran:** Perhaps on that, there are so many different initiatives that schools have had, or do have. A lot of them focus on inspiration, but I understand that the evidence is that most kids find science pretty cool; it is for other reasons that they do not end up taking it up. Where is your evidence for what is working and is not working? How are you measuring success of the myriad different initiatives that you have in schools?

Paul Kett: As the NAO Report lays out, they have specific evaluation plans in place against each of those initiatives. Across Government, we are mapping all those different initiatives. I recognise that there are a very large number, and it can be confusing in terms of the range of those initiatives. One of our commitments is to try to streamline the number of initiatives. We have a piece of work at the moment that is identifying all of that activity across Government. When that was last done, over 10 years ago, there were 400 or so. We have identified about 130, so there is still a significant number, but not as many as there were.

We are trying to consolidate those where it makes sense. For example, we are bringing together some of our maths programmes as a single programme, rather than having two or three separate projects. We are also making sure that we take a more consistent approach to the impact that we are trying to achieve across Government. We will always need to do evaluations for the specific initiatives as part of demonstrating value for money, but making sure that we are tracking against the same overall KPIs is a piece of work that we are doing as part of that, cross-Government.

- Q74 **Layla Moran:** Okay. Let me take a specific issue that has been coming up again and again: the chronic lack of properly trained technicians. How is the work that you are doing specifically helping to deliver more well-qualified technicians who are specialised enough to do the work needed at places such as RAL Space or ISIS? How are you doing that?

Paul Kett: As with any issue in relationship to STEM skills, there is not one single bullet that will address that, but on that particular question I think one of the key areas and key gaps, in terms of where we are not performing as well as we need to be, is in the broader technical and vocational qualification area. The T-levels programme in particular will have an impact on those technical skills. Similarly, the reforms that Jonathan has been talking about in terms of apprenticeships have a real opportunity to make a difference in those highly skilled, potentially at graduate level but not necessarily—

- Q75 **Layla Moran:** This may well be a stupid question. Is a T-level not just an unpaid apprenticeship?



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Jonathan Slater: No.

Q76 **Layla Moran:** Why not, because I am struggling, based on what I have read, to see exactly what the difference is?

Chair: Mr Slater, do you want to explain?

Jonathan Slater: The concept of the T-levels that we are working up at the moment was developed by the post-16 Sainsbury review, which was a cross-party agreement about how best to tackle a chronic shortage in technical skills. It looked at those jobs that are done by 18-year-olds—in other words, that do not require a degree, but require a level 3 technical skill to fulfil them well, possibly complemented by a level 4, 5 or 6 apprenticeship thereafter.

It looked at the population of skills at level 3 or above and technical jobs that the economy needed, and designed a curriculum from 16 to 18 to meet the needs of that demand. You will do a T-level in digital, construction or education; there are 15 routes, defined by the needs of employers. Rather than an A-level, which might be a good route into university, the T-level will be a good route into a high-skilled technical job at the age of 18, requiring not just the development of good technical skills at a specialist or other college, but also a three-month work placement.

Q77 **Layla Moran:** Right, so there is a work placement where you are working for those companies for free, correct? They are not paid.

Jonathan Slater: No, this is the equivalent—

Layla Moran: They are not paid, right?

Jonathan Slater: Just as neither are A-levels paid.

Q78 **Layla Moran:** Yes, but for A-levels you do not go and work for a company for three months.

Jonathan Slater: The reason for the work placement—I have not heard any controversy about this proposition—

Layla Moran: No, I'm just asking.

Jonathan Slater: Absolutely. What employers are saying is that it will enable their 18-year-old to step into high-skilled technical jobs straight away. It is not just about what they have learned by way of knowledge. It is also about what they have learned by way of work ability—that they have actually engaged in the world of work. A work placement is by far the best way to achieve that. It is not that different from a sandwich degree, where you would spend time out of your studies in the world of work. It is designed to enable young adults at the age of 18 to do a high-skilled job of a sort that they cannot do so well at the moment.

Q79 **Layla Moran:** Okay. There is one in hair and beauty, for example. I associate hair and beauty with apprenticeships. At one point, Oxfordshire was training more hair and beauty apprentices than it had working in any



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one year. If there are shortages—I do not understand how you have come up with the list. It goes back to the co-ordination point. How are you co-ordinating to decide exactly what is needed in the industrial strategy and then feeding that back into T-levels? I still do not understand how that is happening.

Jonathan Slater: The work that was done—it was overseen by Sainsbury, with an expert team of people supporting him—was a detailed analysis of the needs of the economy and employers at the—

Q80 **Layla Moran:** That was a snapshot, correct?

Jonathan Slater: Sort of, to the extent that was possible. Clearly, the extent to which one can do it is limited, because the world is changing around us. The work was to identify the needs of the economy with 18-year-olds. It then divided that down into 15 routes. The first three were digital, construction and education and childcare. It was not level 2 health and beauty, no.

Q81 **Layla Moran:** I know that you can get apprenticeships at all levels.

Jonathan Slater: Yes, but we were talking about T-levels, I think.

Layla Moran: I am trying to understand the difference.

Jonathan Slater: Absolutely. I agree there are lots of different component parts to this, and I do this for a living. The T-level is designed for that purpose—level 3 skills to enable people to do a high-level job at the age of 18, of a sort that the current school system does not equip them at all well for.

Q82 **Layla Moran:** The Government are putting a lot behind this, and they talk about it a lot. Mr Chisholm, is this going to solve a lot of problems that we are seeing with the skills shortage? Will this really help?

Alex Chisholm: Yes. Just to take stock of where we have got to, we have looked at the number of STEM students coming through universities and further education, and we have talked about apprentices and the T-levels. Those certainly are very important parts of the overall solution to train up the workforce of the future, to use the phrase of the MP for Don Valley.

Q83 **Layla Moran:** Can you quantify “very important”?

Alex Chisholm: There are two other important things that we have not yet spoken about. One is the national colleges and the national institutes of technology. Four of the national colleges are in STEM subjects: rail, nuclear, oil and gas, and digital.

Q84 **Layla Moran:** And they are delivering T-levels, are they? We are on T-levels. I want to stick with T-levels.

Alex Chisholm: Okay.

Jonathan Slater: They will be. T-levels come into place in the next two, three or four years. They are being rolled out over time. The stage we have reached at the moment is that just as we asked employer panels to



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agree the curriculum for the apprenticeships that came into place 12 months ago, we are doing the same with T-levels. It is a key Sainsbury recommendation. You start with what employers need and break it down into 15 groups, such as digital or construction. You then ask a group of employers to define the curriculum for that two-year programme of work. These will be delivered by FE colleges, as well as by the new institutes of technology and national colleges that are coming on stream at the moment.

- Q85 **Layla Moran:** Okay, I get it. They will help to deliver it. There is a disincentive in the funding system, is there not, for schools to encourage students to take up apprenticeships? That is well documented. Will there be anything different done for T-levels? Have you decided on that funding mechanism yet?

Jonathan Slater: We have been consulting on the detail of it, and we will produce our response to that consultation shortly. Along with the commitment to those 15 T-level routes came half a billion pounds of Government funding in support, which breaks down into a number of component parts, including work placements, the upskilling of the workforce and the capital investment required alongside the additional staff to train it. If these are going to be high-quality products, we need to ensure that they have got highly qualified, trained staff with employers engaged and good equipment to go alongside.

- Q86 **Layla Moran:** You talked about work placements. With that money, are you going to be paying companies to take students? You just said that work placements are specifically linked to the funding, so can you explain how the work placements are linked to the funding?

Jonathan Slater: We have just been out to consultation asking lots of questions about how the work placements scheme should work. We are doing some piloting of that at the moment, so we are up and running in a number of different areas of the country. We are asking the FE colleges to work with local employers to secure work placements from those companies. We will shortly be responding to consultation documents setting out the next level of detail on how we are going to fund it, so I am afraid I am going to have to wait till then.

- Q87 **Layla Moran:** Okay, I understand. I just have one more set of questions about teachers. Design and technology has a massive gap, still, in the number of teachers needed versus the number recruited. Mr Slater, why has this not been something that has improved at all, even over the last 12 months?

Jonathan Slater: On teacher recruitment, would you mind if I asked Paul to say something about what we are doing?

Layla Moran: Absolutely.

Paul Kett: You are right in saying that design and technology is one of the subjects where we have struggled most in terms of securing improvement.

- Q88 **Layla Moran:** Why is that, Mr Kett? Can you break it down for me, very



simply? Why?

Paul Kett: I think we have found the wider economy into which we are trying to recruit teachers generally extremely challenging. We see challenges across the board. That is even more so in those subjects that are in sharpest demand in the broader economy. So across STEM subjects and design and technology we do see the most challenges in terms of teacher recruitment. I think there is a particular issue with design and technology in terms of the link through to the demand from the school system—the numbers taking those qualifications, which has fallen away.

Q89 **Layla Moran:** Can you just repeat that last bit?

Paul Kett: The demand from the school system for design and technology teachers, as fewer students are taking those specific qualifications: some qualifications—we are seeing more increase in mathematics and physics, and so on.

Q90 **Layla Moran:** But is that an active choice that students are making or is that because DT is actually quite expensive to deliver in schools, so schools are finding it difficult to deliver it?

Paul Kett: It is not an active, intentional choice. I am not sure why that is, in terms of the fall-off. There is not the demand.

Q91 **Layla Moran:** Doesn't that matter? Shouldn't you know exactly why this is happening—and therefore you can address the core issues causing it?

Paul Kett: We know in relation to some other subjects where there are demands coming through, and we monitor where the demand is coming from, so we know that there isn't as much demand there. The reason for it, I think, is that increasingly greater capacity is being put into some of the other STEM subjects, where we have seen growth. We have seen significant growth in mathematics, we have seen significant growth in physics. I think it is that trade-off.

Q92 **Layla Moran:** Can I draw your attention to the newly released report "AI in the UK: ready, willing and able?" by the Lords Select Committee on Artificial Intelligence? In it, they are quite clear that things like DT, but also the humanities, are very important in delivering the future economic benefits of AI. They link it with the industrial strategy, but they link it back into schools and say that, actually, schools have got the wrong emphasis at the moment. Is that something that you are aware of, and were you already aware of this?

Paul Kett: First, I should say I am aware of that report. I have not yet read it in detail.

Layla Moran: It is very good—you should.

Paul Kett: I will do; it was only published yesterday. However, on the related question, although I do not know the detail of that report, I think one of the intentions behind the wider curriculum reforms that led to the strengthened GCSEs and the commitment to the EBacc is around making sure we have got the right core knowledge that will then equip young



people for those broader skills. If you look at some of the approaches that we are taking in terms of mathematics teaching now—in terms of the mastery techniques and so on—they are absolutely going to the heart of how we ensure that young people really understand the core concepts underpinning mathematics, which equip them more effectively to go on to further study in those really technical areas. Similarly, in relation to the advanced maths programme that we have got, really equipping young people to take higher-level maths qualifications at A-level and on into university study—critical areas for machine learning and artificial intelligence.

- Q93 Layla Moran:** I am sorry, but we need to move on. The core of my questioning was also about delivering these technicians. I am a maths teacher, so, believe me, I get it. But I also get that there is a vast difference between doing stuff with your hands—having a strong mathematical ability is part of that—and doing the practical stuff, versus the mastery of algebra and more abstract techniques. They are two actually quite different things. What are you doing in the current curriculum to ensure that we have got the right types of skills for the technician type of STEM person, not just the intellectual who is at the leading edge?

Paul Kett: Our reforms to GCSE are designed to equip for both, absolutely. We see that that choice takes place at the post-16 point, whereas, as we have been saying, we actually need to really improve the quality of that post-16 technical education, moving from the 13,000 vocational qualifications, which aren't well understood, to the simplified 15 routes through T-levels. We also need to get at some of the cultural questions around making sure they are really attractive routes to young people. That is part of the challenge.

- Q94 Chair:** Mr Chisholm?

Alex Chisholm: May I just add one thing about AI, not at the schools level but once you get to higher education? As you are aware, we have given a lot of support to the Alan Turing Institute. AI is one of the four grand challenges that we have set out just recently as part of the industrial strategy. We have made available £210 million for fellowships in the four industrial strategy areas and a further £90 million for 1,000 new PhDs, of which we reckon 85% will be in STEM. That will certainly include AI and data specialism.

- Q95 Layla Moran:** If you can get them to that place in the first place, I suppose. I have one last question for Mr Kett and perhaps also Mr Slater. One issue that is part of it is the lack of good, affordable professional development, not just for maths and science but, critically, for IT and ICT as well. Again, what are you doing to address that? Without good training we are not going to get the good teachers, and we are not going to get good teaching and learning.

Paul Kett: In terms of computer science, in particular, we absolutely agree. We are informed by a piece of work that was done by the Royal Society and a number of others. In the autumn Budget, we announced an



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£84 million investment in computer science in the round. A very significant portion of that is upskilling our existing teaching profession, and that will upskill some 8,000 computer science or ICT teachers. That is enough for one in every secondary school in the country.

We are also creating a sort of national centre of excellence, learning from the work that we have done on maths. Having those centres of excellence has really driven the improvement in maths. Coming back to questions earlier from the Committee about whether we are learning and improving on female representation, in particular, we are learning from our “Stimulating Physics” programme. We are building into that investment in computer science, and really focusing on improving participation of females in computer science. That is one area where—although, as we have said, we have had some success in STEM more broadly—computer science has been really hard to shift. So there is a lot going on in that space.

- Q96 **Layla Moran:** I am just going to be cheeky and ask Mr Slater when the national centre for computing is actually going to be set up and running. Is that yours, or is that Mr Chisholm’s? Oh, sorry; it is Mr Kett’s.

Paul Kett: I am happy to answer that question. We are currently out to procurement for the provider for that. Subject to the commercial process, we hope to have it beginning to operate from this autumn. In terms of at scale, it will be from this autumn, although delivering to 8,000 teachers and so on will take longer. We have asked in the procurement for propositions about how best to deliver that.

- Q97 **Layla Moran:** By what point will you be able to come back to us and say, “We did it. We’ve got 8,000”? In your business plan somewhere, there is that number. What year is it in?

Paul Kett: I am afraid I will have to write to the Committee with that detail.

Chair: It would be very helpful if you could.

- Q98 **Sir Geoffrey Clifton-Brown:** We discussed women’s participation in A-levels, and that hasn’t changed in the last six or seven years.

Jonathan Slater: It has increased very significantly in the last six or seven years.

Sir Geoffrey Clifton-Brown: Not according to figure 6.

Jonathan Slater: It hasn’t for apprenticeships, but it has for A-levels.

Sir Geoffrey Clifton-Brown: A-levels, yes—

Jonathan Slater: I thought you said A-levels.

Chair: We are talking about A-level physics.

- Q99 **Sir Geoffrey Clifton-Brown:** A-level physics, on figure 6—we have already discussed this. Participation by women has hardly changed in the



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last six years. It's there in black and white for physics.

As I was about to say before I was interrupted, a report is referred to in the footnote of the NAO Report: the WISE report, written by Professor Averil Macdonald. She says something that I think is very significant: "By the age of 10 or 11 a significant proportion of pupils have already decided that the idea of studying science after the age of 16 and the idea of a career in a STEM area is 'not for me'."

Your careers paper in December actually reinforces that. It says: "Children form views about careers at an early age. There is a perception amongst many young people that STEM subjects are too challenging or not suitable for them." It seems to me that you can do everything you like in universities, apprenticeships and everything else, but if the children are not being given the correct careers advice, the correct advice from their teacher or the correct advice from their parents, and they are not choosing the subjects that are likely to lead them into a STEM career, you are not going to succeed. How are we going to change that situation? It has been going on for the last four years, in this case.

Jonathan Slater: I will ask Paul to come in. I apologise—I did not mean to interrupt you. I was seeking to distinguish between physics in particular and science overall. There has been an 18% increase in science overall, but not in physics. As you say, it is absolutely vital that we get in as early as possible. The STEM ambassador programme, which Paul has referred to and which Alex funds, goes into primary schools as well, for exactly the reason you describe. The work that we have commissioned the Careers & Enterprise Company to do—to engage children at school, connect them with the world of work by giving them opportunities to see what actually goes on, and open their eyes up to new possibilities—is a vital part of the success of that careers strategy, too. We absolutely recognise the need to get in at the primary school end. Do you want to add to that, Paul?

Paul Kett: I started answering one of the earlier questions in terms of our understanding of the position. One of the things we have sought to do is to use the work of the Wellcome Trust around the nature of those barriers that females, in particular, are reporting. It is a combination of their own self-confidence in their abilities—girls are more likely to underestimate their abilities compared with boys—and beliefs about the nature of the profession. In particular, girls are more likely to be interested in careers that are more caring in nature or more directly associated with supporting individuals. That is the work that the Wellcome Trust has done, and we are trying to target our interventions at those issues. I can give an example of the stimulating physics programme—sorry, stimulating physics—

Layla Moran: You can do either.

Paul Kett: It focuses on improving the confidence and resilience of girls in primary and secondary schools in relation to physics, so building confidence; ensuring that those teaching those subjects have an awareness of good, inclusive teaching techniques, so they do not accidentally reinforce those biases; and whole-school projects around raising awareness of gender stereotyping in school. That initiative has



proven successful in improving performance in terms of opting to take those subjects to higher levels of study, so we are trying to take that learning into the work on computer science that I mentioned and also the work in relation to higher levels of maths participation. We are trying to apply that learning across. There are specific examples we think are working that we are now trying to scale up in other subjects.

Q100 Sir Geoffrey Clifton-Brown: With great respect, Mr Kett, I do not think that this ambassador initiative—good though it may be—is the answer, because what we are looking for is a very large number of our youngsters being given the correct advice—it does not matter whether it is from a parent, a teacher or a careers adviser. In a lot of areas of this country, and I think it is particularly true among women and among certain socio-economic and ethnic groups, our youngsters are not being given the right advice at an early enough age. What is the Government doing to address that?

Jonathan Slater: The careers strategy absolutely recognises the gap in careers advice in schools—I was focusing specifically on initiatives designed to tackle STEM and girls—so one of the things we are doing about creating a decent infrastructure of careers advice across the piece in schools is ensuring that a member of the senior management team in each school in the country has responsibility for careers advice, that they are properly supported in the way that they are trained for that task, and that we put in funding for careers hubs in parts of the country that particularly suffer from an absence of good quality support—building on the success of the Careers & Enterprise Company—to supplement what is done school by school.

We absolutely recognise the truth of what you say. That is what we announced in December. Now we need to make it a reality.

Paul Kett: Just to add specifically on the Careers & Enterprise Company, in their “What works” series, we have explicitly agreed with them that they will focus on STEM as part of providing toolkits of what works. That is to your point on ensuring that we are sharing best practice.

Q101 Chair: How are you factoring in, though, the number of young people who are still put in for foundation papers, which cut out chances later in life? Often they are not aware of that at a young age—sometimes their teachers are not aware. I have come across myriad examples in my constituency; indeed, I think we all have.

Layla Moran: Triple science.

Chair: Exactly—triple science or combined science versus separate sciences. How are you making sure that that is driven through? It is not just about careers; it is sometimes about the subject needs and not understanding the implications of the decision on the young person’s future career and the STEM pipeline.

Paul Kett: The examples I gave earlier, the Stimulating Physics programme, the advanced maths programme and the computer science

programme, are all targeted at areas where we see low participation rates, so where those problems may be occurring, we are particularly targeting those resources at those areas.

Q102 Chair: But what does that mean if you're a teacher on the ground? You say you are targeting that resource. What are people getting? What is going to make the difference?

Paul Kett: To bring it to life, I might mention the opportunity areas that we work in—the 12 most disadvantaged areas of the country. There are specific offers to all the headteachers in those areas, in terms of the support that they can be provided with. So it's a case of directly reaching out to those schools. Then, in terms of broader areas, there are the hubs and the networks, which are school-based. We require them to reach out to those areas where there are low levels of participation. We use those hubs to reach those schools with low participation.

Q103 Sir Geoffrey Clifton-Brown: Mr Kett, to ensure that every single school in this country provides the better careers advice that we are talking about, is the Ofsted regime being changed so that the school will be very clearly advised that it will be judged on the quality of its careers advice?

Paul Kett: There is no plan at the moment to change the Ofsted framework. The timetable for the renewal of that framework is coming up in 2019, so that will be a matter of discussion and decision.

Chair: Timely!

Q104 Sir Geoffrey Clifton-Brown: But this is a problem we can't wait for. Ms Keegan has already said this. We need to be internationally competitive. The STEM issue is really important. I have just come back from Hong Kong. I have seen the standard of a primary school in Hong Kong, and it is light years ahead of us on this. We can't wait, and you are talking about waiting another year till 2019. What are we doing in the meanwhile?

Jonathan Slater: Paul was talking specifically about changes to the Ofsted framework, which, as a simple matter of fact, are determined by Ofsted, not by us. They are currently working on a change for 2019, but that should absolutely not stand in the way of our getting better practical support to children who need it, now. That is why the careers strategy set out those plans, which we are implementing now, for careers advisers school by school, with extra support in those parts of the country that need it the most, supported by the Careers & Enterprise Company bringing kids to actually engage with employers in their locality to see opportunities that they have never considered before. We are doing that now.

Chair: Okay. I'm going to bring in Anne Marie Morris.

Q105 Anne Marie Morris: Mr Kett, you might recall that this Committee has looked at the issue of how we enable teachers, particularly physics teachers and physics grads, to come into the system. I think it was last year that the Committee looked at the issue of the golden handshake, the golden hello to physics graduates. I think that in our recommendations



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we asked you to come back with some sort of destination analysis on how well it had worked and that that was recorded in the Treasury minute. I think it was promised this April. Do you know where that has got to and what analysis has been done on the success of that scheme?

Paul Kett: In terms of the specific return to the Committee, I would need to double-check exactly where it has got to. What I can tell you in terms of the analysis of the work is that we have identified how the bursary impacts in terms of improvement rates in relation to applications. What we have not yet got to is the tracking all the way through—how long they stay in the system and so on. So I think we are partially there.

We are committed more generally to looking at our overall bursary regime in terms of its performance, as well as the new initiatives we introduced for this cycle for mathematics teachers in particular—rather than just a single bursary, a staged payment link to retention as well. So we are looking at that in the round. The Secretary of State has just committed to a broader recruitment and retention strategy, which will look at all those issues. That is partly in response to the recommendation that the Committee made.

Q106 **Anne Marie Morris:** That is still a little bit of: “We are doing..., we are doing...” We still haven’t got the response promised in April. Do you think that you could write to the Committee within the next fortnight to tell us what the current position is, with some sort of timeline for when we might see both the information promised in April, what you are expecting to do with regard to the overall bursary programme, and what steps you are expecting to have achieved by the end of this year?

Paul Kett: Of course.

Q107 **Anne Marie Morris:** Lovely. Can I move on to another initiative that the Government introduced to look at how we can improve these STEM abilities? University technical colleges have all had a challenge recruiting enough students, and they have all had challenges in terms of their Ofsted reports. Even my own has only just had it, and it was not a great result. I think most of them came out with “needs improvement”. What went wrong? What can we learn from how we established the UTCs that we can make sure we do not do when we start looking at other specialist and technology institutions?

Jonathan Slater: There is a mixed picture, isn’t there? As you say, some have struggled, some have done very well, and some have closed. We definitely need to learn from what has not gone well and what has gone badly. We need to look at it in the round, don’t we? Holding a UTC that takes kids at 14 through to 19 to account under a regime of testing them on how well they have done at the age of 16 is a lesson for us. We need a more rounded view of the contribution that the UTC is able to make to the kids who arrive at the age of 14, halfway through their GCSE period.

For example, a better measure of the added value of a UTC seems to me to be the extent to which those kids go at the end—after the four to five years they have been at the UTC—into productive employment. It is



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striking that the average UTC gets 20% of its kids into apprenticeships, which is three times the level of your typical state school. For higher-level apprenticeships, it is four times the level of a typical state school. I think we probably need a more rounded sense of success and failure than we had at the beginning of the programme.

- Q108 **Anne Marie Morris:** That is all very helpful, but it seems to me that one of the key drivers towards the failure of this initiative was that competition was built into the system. Schools were desperate to keep the children they had because every pupil you have is money. Therefore, the bright ones were disincentivised from going to the university technical colleges, and the result was that the ones who were encouraged were the ones who were probably least able to benefit from that education. Do you think that this in-built competition, which strikes me as really destructive to the whole programme, is a real issue that needs to be looked at?

Jonathan Slater: It definitely is a challenge for UTCs that they are taking kids on at 14, halfway through the secondary phase of their—

- Q109 **Anne Marie Morris:** Mr Slater, I am not asking you that. You have already given a very good response. My question is: if you set competition in place between the other schools—the mainstream schools—and the UTCs, and it is all about money, is it not unsurprising that the kids who probably would most benefit from the UTCs don't end up going there?

Jonathan Slater: I wasn't around in 2010, but I have looked back at what was done at the time. I think there was a recognition of the challenge that would be faced in taking kids on at 14. The idea was to explore the potential gain by providing a technical curriculum for kids from the age of 14—

- Q110 **Anne Marie Morris:** Let me stop you there. You are not really answering the question, Mr Slater.

Jonathan Slater: It is in the nature of designing a curriculum for 14 to 18-year-olds, in partnership with the university and employers, that you will be competing with other schools in the area who would quite like to keep their 14-year-olds. That was done with the Government's eyes open, as I understand it. Sometimes it succeeded, as in the case of the Sheffield UTC. Other times it has not.

Chair: I think Ms Morris might remind us what Michael Gove said about it.

- Q111 **Anne Marie Morris:** I think the issue is about what you are going to do when you look at your new technical colleges. Are you going to put something in place that ensures that we do not have this issue of competition between mainstream schools and technical education?

Whatever you set out, whether it is UTCs—forget the age for a minute, because the same would apply, frankly, whatever age it is—it is going to fail, unless you have some mechanism to ensure the right key to get there for the ones with the aptitude, the ones the who will actually do well, instead of making it a straight financial fight. We have already



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talked about the challenges that we have because it is not that well-respected to go into the skills piece as the academic piece. What are you going to do?

Jonathan Slater: I apologise if I am not getting this point across well enough; I really am trying to respond to your question. The particular competition challenge faced by UTCs is taking kids on at 14—that is what I am saying—because that definitely puts them in competition against the local secondary school that has the kid in it at age 14 and would quite like to keep hold of them, because there is five grand in it if they do so.

I completely acknowledge that that is definitely the risk in the UTC programme. It is only the risk in the UTC programme—since you are asking about the extent to which it plays into institutes of technology—because institutes of technology will not be taking kids at 14. That is the crucial thing about UTCs, which creates a challenge. It also creates an opportunity and some of those UTCs have succeeded, but that is the risk, absolutely.

Q112 **Chair:** I think the former Secretary of State has acknowledged that it wasn't a success, so you stopped short of that. Do you see the Department sponsoring many more UTCs, given what you have learned?

Jonathan Slater: We are overseeing a number of UTCs today and our task is to make them all as successful as we can.

Q113 **Chair:** Those are the ones that are there. How many are in the pipeline?

Jonathan Slater: One application for a new UTC has been made and is being considered at the moment in light, among other things, of the learning of the previous seven years.

Chair: Given that a fifth of them close, it's interesting that there is only one.

Q114 **Gillian Keegan:** Can I just challenge something you said? You said that this is only a problem at the age of 14. I think it is a problem at the age of 16 as well. If a school has a sixth form, you have exactly the same built-in competition. This is designed to fail or to have pupils that they are happy to let go. It will be the same at 16.

Jonathan Slater: I absolutely see that if you are in a particular constituency or a particular area of the country where there is a choice between a school sixth form and an—

Gillian Keegan: Most places do have that choice.

Jonathan Slater: If there is a choice between an FE college and a sixth form, you will get competition between the two. Clearly, one needs to get the best combination of complementary provision from the two, rather than duplicating each other.

Q115 **Gillian Keegan:** But you built in a system that is designed to fail, because school funding—I go through all the school funding and they are all very worried about school funding. The thought of trying to replace



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students at the age of 14 or 16, which are absolutely crucial to you keeping to your budgets, is a nightmare for them. They are not incentivised at all to support your strategy. They are incentivised to support their own school funding.

Jonathan Slater: The institutes of technology are seeking to address a gap in the market, which I was discussing earlier with Layla Moran: an absence of high-quality technical skills being taught post-16. This will not be duplicating work that is done by school sixth forms. It really won't.

Q116 **Gillian Keegan:** It is the same pupils. That's the point. The point is that it is the same pupils, and pupils mean money.

Jonathan Slater: Typically, I would expect that of the kids who are doing these T-levels, some of them will make a choice to switch from A-level to degree, of the sort that your typical school sixth form might do, but the real focus here is the provision of a good quality service that does not currently exist, in which you have a whole multiplicity—array—of post-16 FE provision.

Q117 **Gillian Keegan:** Nobody is disputing that, but do you not understand that these pupils are a captive market within the existing organisation that they start with—the school? That school has the ability to sell whatever they do next. They have a massive incentive to keep them there. They will always believe that they can offer a better education than anybody else anyway. You have built in a system that is going to design—no matter whether it is the best thing for the child, the industrial strategy, or anything else. Do you not accept that this will be as unsuccessful as the other attempt?

Jonathan Slater: A combination of school sixth forms and further education colleges is not a new concept. It has been with us for decades, hasn't it?

Q118 **Gillian Keegan:** Yes, but we have a specific mix of types of pupils going into types of areas. What you are trying to do is to get the brightest pupils into a new area. The brightest pupils are economic drivers, but they are the brightest as well.

Jonathan Slater: The purpose of the reform is not to replace A-levels. It is not to seek a reduction in A-levels; I am not seeking to reduce the number of kids doing A-levels at all. There are about 13,000 technical qualifications, of enormous variety and complexity, which I am trying to turn into 15 routes that are highly invested in, which will provide better quality FE provision. I do not expect school sixth forms to be in that market particularly; I expect there to be plenty of work for both.

Chair: You use the word "market" and I think that is one of the challenges. The free schools approach is one of the things that has opened up that market in education. I am going to bring in Layla Moran and then come back to Ms Keegan for the last points.

Q119 **Layla Moran:** We haven't spoken about Brexit yet. I know you have missed it! Mr Chisholm, how bad is the problem of Brexit for the skills



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workforce and STEM?

Alex Chisholm: Let us just take a look at different dimensions of that. First, we have got the interim report from the Migration Advisory Committee, and they have highlighted some sectors of the economy where there is a very heavy level of dependence on EEA workers, EU27 workers—in particular, warehousing at 18% and accommodation and hospitality at 13%. Food and drink manufacturing is the highest one at over 24%. Of course, the higher education sector itself has a high proportion of the faculty coming from the EU27—some 17%, according to the latest estimates. Those are some of the sectors most significantly dependent on EEA workers at the moment.

Q120 **Layla Moran:** Forgive me, but that wasn't quite my question. My question was specifically about the STEM ecosystem in this country. We know that we do not have enough people who are homegrown. In fact, there are not enough across the world; it is a world problem. So how much worse is the problem going to get specifically in the STEM sector and related sectors as a result of Brexit?

Alex Chisholm: Of that 17% in higher education, a higher proportion still—

Layla Moran: But not just higher education—this is much wider than higher education.

Alex Chisholm: Okay, but that's an important group.

Layla Moran: Okay, take that first.

Alex Chisholm: Particularly in STEM subjects, where there is quite a lot of research, that proportion goes up a bit. In terms of students themselves, I think that just over 5% of students in higher education are from EU27 countries. There are certainly going to be some effects there in terms of the workforce coming through with STEM skills.

Q121 **Layla Moran:** Going to be? Have you not had any evidence that it is happening already?

Alex Chisholm: No, actually.

Layla Moran: Oh, because I have.

Alex Chisholm: There have been quite a lot of predictions of that, but if you look at the latest figures from UCAS for applications to the March deadline—so the very latest figures—they show a rise in EU applications to 46,000, and that is the second highest year on record. In terms of applications from the rest of the world, it is the highest year on record. The ability of the UK higher education sector to attract talent from the rest of Europe does not yet seem to have hit any of the proverbial cliffs.

Q122 **Layla Moran:** We are running short of time, so I am sorry to press you, but moving on from the university sector, which is one specific thing, to the wider sector, have you had any evidence that Brexit is beginning to



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have an effect?

Alex Chisholm: In short, I would say not really, no. It is really to do with forecasts. What you see is that many different sectors from aerospace to auto to energy, and particularly nuclear within energy, have quite a high reliance on people coming from the rest of Europe. Companies come to us and say, "Currently, a lot of our skilled workforce with STEM skills is coming from other countries in Europe, and we're moving people around from different countries in Europe to the UK—sometimes direct recruits and sometimes just sending people here for a period of months." That is very important to their current ability to operate. Clearly, what matters is how much that adjusts going forward.

Businesses were reassured by the developments last December, when they saw that people working here already would be able to stay for a period of time, so their existing workforce was no longer feeling so anxious about the next move. In March, we heard that people arriving during the transition period—March 2019 to the end of 2020—will also have those rights. What we need to see next is what the system will be for managing the flow of talent after 2020.

Q123 **Layla Moran:** First of all, I want to challenge you. What you have just said does not match what I have been seeing. For example, in Oxford Innovation and a number of spin-out companies from Oxford, every single company—it was half a dozen at least—said that they have had people already leave and they are struggling to recruit new people in from the EU27, because while some businesses feel reassured, those workers do not. Do you not recognise what those businesses, those start-ups, were telling me? Is that not something you have heard?

Alex Chisholm: I am sure you will hear examples from all over the country and all different sectors of some people who have experienced people leaving them and other people joining them, and some interruptions and concerns about that, but the overall aggregate picture does not yet show a big problem.

Chair: But the aggregate picture does not solve the problem of Ms Moran's businesses.

Q124 **Layla Moran:** Exactly. Some of them are saying that they are thinking of leaving and moving to Berlin, and in some cases Silicon Valley. This is not going to help our productivity problem. On the other end of the spectrum we have RAL, which has lost five high-level engineers and is struggling to recruit. All I want to know is how are you measuring this now? This is a critical issue. It is urgent. It is happening now and if we lose these people, it will be hard to get them back. What are you doing to address that?

Alex Chisholm: That is the specific commission given to the Migration Advisory Committee, which is reporting in September on that very issue. It is looking at the impact on the whole economy of EEA workers, sector by sector, in every region of the country, both today and going forward.

That is its job. We are as keen as you are to see what the outcome of that is.

Q125 Layla Moran: Professor Loughhead, do you recognise this? Is this something that you have heard from your network of advisors?

Professor John Loughhead: I can really echo Alex's point there. I have heard lots of examples of such moves, but I have also heard examples of moves in the other direction and of repatriating UK workers.

Q126 Layla Moran: Is that equalling out?

Professor John Loughhead: I can't quantify it, but from the experience that I have had previously, this seems to be almost business as usual to a large extent. People do move. They move for all kinds of reasons. There is evidence that people have gone. There always has been. There is evidence that people are coming in. I could cite you four companies I know which have seen probably almost 20 people, fairly skilled, coming into the UK from either the EU or outside the EU.

Q127 Chair: Can I just ask you a question, Professor Loughhead? We have heard from you and Alex Chisholm that—you gave us a quick anecdote, as Ms Moran did too. What are you doing in your Department, Mr Chisholm, to measure what the impact is, not just the aggregate and the flows?

Layla Moran: Which needs to go up.

Chair: It is about the individual sectors and particular needs. Surely you are not looking at the Migration Advisory Committee to just get on to it without any input from your Department, given that you will lead on the industrial strategy, which your Secretary of State was talking about in the House just now.

Alex Chisholm: We are, but it is a cross-Government undertaking. The Migration Advisory Committee is not working in isolation. It has taken evidence so far from over 400 different bodies, so that will be a very comprehensive view of the needs of the economy. We are also very keen to see the results of the employer skills survey, which the DFE is conducting at the moment, which will be available in the summer. We take all the evidence that we can.

Q128 Layla Moran: On the specific example of Harwell and the STFC not being able to fill roles from the EU—now they have advertised abroad and they still can't get them, or when they do, they have troubles with visas—do you feel that the public sector pay cap is having a negative effect on those kinds of organisations? They are telling me it's a problem. Do you recognise it to be a problem?

Alex Chisholm: I have not heard from them specifically on that issue, but since you have raised it twice now, I will certainly make inquiries after this meeting.

Q129 Layla Moran: Do you feel that it would help you in the industrial strategy



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for companies such as Harwell to essentially have carte blanche to bring over the right sorts of people for them from anywhere in the world, to fill the gaps in their skills shortage? Would that help? I am not saying that you can do it, but would it help?

Chair: I think, Ms Moran, you mean public, Government-funded institutions.

Layla Moran: Public, Government-funded institutions delivering public projects with public money. Would it not be helpful for them to just say: "Right, we need this person; can we just bring them in now?" Would that not help you?

Alex Chisholm: I think that all employers, both public and private sector, would like the maximum possible choice of people to recruit. That goes almost without saying. We need to recognise, as part of that, that there is a national policy dimension here and the Government have had a long-standing ambition to try to limit the number of net immigrants, and this needs to be part of that.

Q130 **Layla Moran:** Can you not see how circular this is becoming? The Government have done their due diligence, giving, for example, £99 million to Harwell to deliver the satellite or whichever project it was. That £99 million cannot be delivered efficiently because they cannot get the right people to come in, and part of that is to do with their inability to access the right people at the right time. I appreciate that this decision was not yours, but what pressure are you putting where to ensure that this isn't a problem? It is a big problem.

Alex Chisholm: As I mentioned, in terms of the uncertainties that employers face, we took two steps forward in December and March. The third step will be very important, because for the people from elsewhere in Europe considering coming to work in places like Harwell, it might be a considerable move for them. They might be bringing their families across and they might want to know what the future looks like over a number of years, not just to the end of 2020. Further clarity on that, once the Government have determined their position and begun to negotiate with Europe on those issues as well, will be very valuable.

Q131 **Layla Moran:** That is the EU27. What they are saying is that they can get these people from places like India, for example, but that they have these visa issues. What pressure are you putting on, for example, the MAC or the Home Office to ensure that they get the right people now? They are being asked by the Treasury to deliver these projects to time as well. Public money is being spent inefficiently as a result of Government policy.

Alex Chisholm: We make representations to colleagues at all levels in the Home Office about this—not just us, but businesses and employers directly. In fact, that is one of the reasons why the limit on the number of available tier 1 visas for exceptional talent was doubled in January. Changes can be made in response to clear evidence of where there are shortages or restrictions that affect institutions like Harwell.



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Q132 Layla Moran: Moving on to the pay gap, there is a very leaky pipeline for women, even when they start in professions. Can I ask you to explain to the Committee your assessment of the main reasons for that?

Chair: I think Ms Moran is saying that, when people get in, they don't always stay.

Layla Moran: My understanding of the data that is now coming back is that science-focused organisations, including universities and pharmaceutical companies, have a pay gap 50% greater than the national average, which is one of the worst of all sectors. First of all, do you recognise that?

Alex Chisholm: Yes.

Q133 Layla Moran: Why is it happening, because you cannot fix it unless you know that?

Alex Chisholm: Lots of factors have come into that. One probably very strong one will be the skew in the mix of subjects, which we were talking about before. For example, as we spoke about, biology, as a university degree subject, has a high proportion of women; I think 62% of biology students are women. Biology earns you less money, on average, than physics or mathematics. Physics, computer science and engineering particularly have over-representation of men, rather than women. People using those skills in their careers are better paid. It is a further manifestation of the problems at school and university level that we were discussing earlier.

Q134 Layla Moran: Do you know, or are you looking at, how much the culture of science and technology organisations, including universities, is different from other places? I hear lots of women say getting flexible hours once they have had kids is even harder in organisations in this sector than in others. What are you doing to make a proper assessment of the issues, and what are you doing to tackle them?

Alex Chisholm: Do you mean higher education institutes?

Layla Moran: It is not just higher education institutes. It could be lab-based particularly, or anything at all in the sector. It seems to be quite ubiquitous.

Chair: Professor Loughhead?

Q135 Layla Moran: Professor Loughhead is nodding. Do you recognise this?

Professor John Loughhead: First of all, there is a recognition that there is a problem. If you look at the work of some of the professional institutions—the Royal Academy of Engineering, the Royal Society—they are trying to establish the underlying reasons.

I will give a personal view about one of the contributions to that, particularly in terms of working patterns and working styles. Much of the higher-level science and engineering effort involves a continuum of intellectual application, usually by an individual, rather than a set of



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activities shared out among a larger team—even though you may be sharing loads, there tends to be something continuously going on with the individuals. That has typically been an excuse—I use that word deliberately—for why it is difficult to introduce more flexible patterns, and the absence of flexible patterns could be a feature in the area about why the careers are less attractive to women, particularly if they are engaged in the process of raising a family and they have childcare responsibilities. You can see patterns like that. Some of the work that is going on looks at how that can be overcome.

In Government as well, we now formally have a science and engineering professional organisation, which has over 20,000 people working in that way. The way in which the organisation of work has an impact on the development of careers and the persistence of people in those roles is one of the things that we are looking at in that professional organisation, to add to what the institutions and other bodies are doing to try to understand it.

Very briefly, undoubtedly it happens—it would be foolish to say it does not—but it is recognised as something we need to better understand and find ways of handling as we go forward. I cannot tell you today what the solutions are to that; simply that it is an issue that is identified.

Chair: And I know it is an issue about which we have much debate in this place across many Committees of the House.

Q136 Gillian Keegan: Perhaps because I have worked in tech for 30 years, or maybe because I am aware of the global challenges we face, I feel very uneasy that we have a set of strategies that are flawed in design and not well integrated to deliver the industrial strategy, which we started by agreeing was crucial. I am looking for hope. In the report, that lack of integration is understood. You have a STEM lead and there will be a board that will try to integrate all those activities across Government. Who is responsible for that and what is the make-up of that board?

Paul Kett: I chair that group. We recognised, after the Green Paper on the industrial strategy but before the White Paper, that we needed to convene across Government all the activity that is going on. We started off by bringing together—

Q137 Gillian Keegan: Who is on it?

Paul Kett: Representatives from the Department for Education, the Department for Business, Energy and Industrial Strategy, the Treasury, Research Councils UK, the Department for Transport—

Q138 Gillian Keegan: Maybe I could ask the question a bit more specifically. Who is on the board who understands STEM, skills delivery, the needs of business and the industrial strategy?

Paul Kett: We have representatives from across Government Departments—

Gillian Keegan: From their skills and experience.

Paul Kett: They are a mixed range of civil servants from a—

Gillian Keegan: You can say nobody if it is nobody.

Paul Kett: No; I wouldn't want to kind of—they are the policy experts in their Department on these areas.

Q139 **Gillian Keegan:** Has anybody worked in industry—in science or technology?

Paul Kett: I genuinely do not know, in terms of the specific people who are around that table.

Q140 **Gillian Keegan:** I would recommend that you look at potentially adding those skills.

My second question is about the skills advisory panels, which are also where I am looking for hope. We got rid of the other industry-led sector skills boards more than a year ago, and we have had a vacuum for a while—it might be a convenient vacuum, but it will not help you to deliver your strategy. The new idea is to have skills advisory panels in conjunction with the LEPs—I am not sure what the driver for that is. They are critical to your understanding what you are solving. How are they going to work in practice and when will they be in place?

Jonathan Slater: The idea of the skills advisory panels is to use them to identify the skills needs of—

Q141 **Gillian Keegan:** I understand that. When will they be in place?

Jonathan Slater: We are setting up seven of them now. I was going to try to answer the question about why they are based in LEPs, because that brings together local employers in the area, so why not work with them?

Gillian Keegan: Some of them work well and some of them work terribly.

Jonathan Slater: We are spending the next six months putting the first seven in place: five LEPs and two combined authorities, Greater Manchester and the West Mids. What we are doing at the moment is designing those arrangements with those seven bodies, with a view to learning what works, what doesn't and then rolling out across the rest. The idea is, where their capacity is weak, to help them to improve it—precisely for the reason you have described—and sharing what we have nationally and drawing up the data that they have locally so that we can get a much better sense, area by area, of what the skills needs of the local economies are.

Q142 **Gillian Keegan:** When can you tell us, on measurable objectives, how successful they have been?

Jonathan Slater: We will have the first seven running in six months' time. After a year of operation, we can report back about how the first year has gone.

Paul Kett: We are planning an evaluation in August 2019.



Q143 Sir Geoffrey Clifton-Brown: Mr Slater, in 2015-16 there were 75,000 graduates in STEM subjects; less than six months later, only 18,000 were known to be involved in STEM jobs. Doesn't that strike you as a shocking waste of resources?

Jonathan Slater: It is a bit more complicated than that. The NAO referred to 24%, but that is 24 out of 80, not 24 out of 100. Of course 18%, as identified in the Report, are doing further study and research, which is a good thing. That gets you to about half, to say nothing of people who are teaching STEM subjects, who don't count either—you definitely want physics graduates teaching physics—and so on and so on. You might even want the occasional permanent secretary or DG that runs a STEM cross-Government working group to have postgraduate degrees in STEM subjects, even if you don't call their jobs STEM professions. So you wouldn't want all STEM degrees to be in STEM careers.

If you take it down to the next level, it is a game of two halves, in which for maths, physics, engineering or IT, it is the large majority; for biologists, it is not. So there is a very different thing going on for people doing biology degrees, as was referred to in the NAO's Report, where one in five people with biology degrees go on to do STEM subjects. That is why the typical biologist gets less well paid. That is the sort of conversation we were having earlier.

Q144 Sir Geoffrey Clifton-Brown: Mr Chisolm, judging from everything you have heard today, are you confident that you are going to have enough people with STEM skills to fill your four new colleges?

Alex Chisholm: I think we should recognise what we need. This is a reform agenda where we are looking at apprenticeships, T-levels or the new national colleges and institutes, and those are all things where we are not staying put. We are looking to change the whole organisational framework for the supply of skilled people in those areas, so those reforms need to work.

What is also true, although we haven't talked very much yet about the research base, is that again there is a lot of change there. We have hugely increased the amount of funds available there. Around £1 billion is being spent this year in support of the research base—that is people doing doctorates, studentships, fellowships and so on. Around three quarters of that will be on people studying STEM things.

There has been a very big increase by the Government as a conscious act of policy in order to support the industrial strategy. We have also changed the entire organisational framework for that. Just this month, UK Research and Innovation will come into existence from the merger of the research councils, part of HEFCE and Innovate UK. Whichever direction you look, you can see that there is a lot of change and a real determination to ensure, on this long-standing issue of the UK's need for more people with STEM skills—both advanced STEM skills and also skilled technicians—that this time we are going to make a success of it, because we see it as so important within the industrial strategy.



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Q145 Sir Geoffrey Clifton-Brown: Have you made any comparisons? This question came up earlier. Having just come back from Hong Kong and having seen the technical training that goes on there, my judgment is that it is well ahead of what is going on in this country. What international comparisons are you making? Does this worry you, if we are to remain competitive as a country?

Jonathan Slater: We could answer that at different levels. We compare ourselves in the school system—

Q146 Sir Geoffrey Clifton-Brown: I am talking about STEM skills.

Jonathan Slater: In STEM subjects at school—

Sir Geoffrey Clifton-Brown: Yes. That is what this whole hearing is all about.

Jonathan Slater: We compare ourselves in STEM subjects in schools with our OECD counterparts at the ages of nine to 10, 13 to 14 and 15 and so on. What we find is that we are above the OECD average in science and maths at nine to 10 and 13 to 14.

Q147 Sir Geoffrey Clifton-Brown: I think we really are interested in post-16.

Jonathan Slater: Okay, sorry. Are you asking whether we are learning from the Hong Kong—

Q148 Chair: Internationally. You tell us what you are doing.

Jonathan Slater: Fine. At post-18, we have got some of the very best institutions in the world. We have four of the top 10. What we have not got when we compare ourselves with some of our competitors is a good international offer at the 16-to-18 technical end. That is the point of the T-level reforms I was referring to earlier. That is the point of the institutes of technology that we are putting in place. That is the point of the national colleges we are putting in place. That is the gap that we are seeking to fill when we compare ourselves with the world's best.

Alex Chisholm: If I can just add to that, the most obvious point of comparison for us as a very big economy in Europe is Germany and France. Both those countries have a better system for delivering that type of technical education at 16 to 18. That is what we are looking to catch up with.

Chair: Thank you very much for your time. As ever, the transcript will be up on the website uncorrected in the next couple of days. Our Report will be out in due course; I cannot give you a precise date. Thank you.