HOUSE OF COMMONS

Science and Technology Committee

Oral evidence: Diversity and Inclusion in STEM, HC 95

Wednesday 15 June 2022

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Watch the meeting

Members present: Greg Clark (Chair); Tracey Crouch; Carol Monaghan; Aaron Bell; Dehenna Davison; Rebecca Long Bailey; Graham Stringer.

Questions 363 - 479

Witnesses

I: Mr Robin Walker MP, Minister for School Standards, Department for Education; and Paul Kett, Director General, Skills, Department for Education.

II: Kemi Badenoch MP, Minister of State for Equalities, Government Equalities Office; Marcus Bell, Director, Equality Hub, Cabinet Office; and Gillian Unsworth, Head of Gender and Workplace Equality, Cabinet Office.

III: Professor Dame Ottoline Leyser, Chief Executive, UK Research and Innovation; and George Freeman MP, Minister for Science, Research and Innovation.

Examination of witnesses

Witnesses: Mr Robin Walker MP and Paul Kett.

Q363 **Chair:** The Science and Technology Committee continues and, indeed, this morning concludes our oral evidence on diversity and inclusion in STEM. We are going to hear from three relevant Ministers and their officials. We are very pleased to welcome Robin Walker MP to start off our questions this morning. Robin is the Minister for School Standards in the Department for Education, and he is accompanied by Paul Kett, the Director General for Skills at the Department for Education. Thank you very much indeed for coming before the Committee.

Minister, perhaps I may start with a question to you that deals with some of the context of our inquiry. We have heard evidence about the disparities between boys and girls in taking science subjects and STEM subjects at school. For example, of those taking A-level physics, only about 20% are girls and 80% are boys. In maths, it is 40% girls and 60% boys. In computing, it is 15% girls and 85% boys. These disparities have been in place for a very long time now. Why has there not been more progress, given that successive Governments have been aware of it and have been determined to do something about it?

Mr Walker: It is a fair question, Chair, and this is an important inquiry in that respect. It is important to recognise that there has been some progress in most of those statistics. It is probably worth me going into a little bit more detail as to where we have come from on that front, and some of the other areas within STEM where we have seen a stronger balance.

Since 2010, there has been a 35% proportional increase in the number of STEM A-level entries from girls in England. Girls now make up half of the science A-level entries across the piece, if you look at biology, chemistry and physics, with an increase of about 41% in the number of science A-level entries by girls in England between 2010 and 2021. The percentage of girls in the A-level cohort taking physics has increased, but only slightly—from about 4% in 2010 to about 5.5% in 2021. It is right to recognise that we would like to see more progress on that front. We recognise that that remains low, and that the percentage of girls taking further maths and computer science is also low.

However, despite that, if we look at grades, A* and A grades for girls are comparable to boys in each of the A-level STEM subjects, and are only three to four percentage points lower in maths and further maths.

Entry rates for EBacc—one of the big initiatives from Government over the last 10 years, looking to drive the take-up of science and maths at GCSE level—have increased very substantially. Entries for the EBacc science component for state school pupils have increased from 63% in 2009-10 to 95.9% in 2020-21, and 96.8% of girls at state schools were entered for the EBacc science component in 2021. If we look at maths,

98.1% of girls at state schools were entered for the EBacc maths component of GCSE in 2021.

There are some areas where real progress has been seen, but I do not think that that means that we can let up on the support and work that we are doing specifically, for instance, in physics, computing and advanced mathematics, to try to drive up diversity and uptake by girls.

Q364 **Chair:** It is not a question of letting up, because clearly the progress is marginal, as you say. There might be more girls taking A-levels than in the past—we know that—but the proportion doing further maths and physics, for example, is marginal at best. The fact that you said that the grades are comparable establishes the fact that there is no lack of ability on the part of girls; it is the choice in the first place. One of the questions before this inquiry is: how can we break out of only incremental improvements and have a substantial change in participation? Do you have any views on how that might be done?

Mr Walker: We should look at some of the areas where we have seen that succeed already—in maths, for instance, at GCSE—and look at approaches that have engaged people more broadly. The shift towards a mastery approach of maths—one that does not accept that there are people who cannot do maths and really works to bring the whole class and children of different abilities along—has been very successful, at both primary and early secondary. We need to make sure that we then project those approaches through. Paul might be able to add to that from the skills perspective.

Paul Kett: Yes, I will add two things, if I may. First, there is the quality of the teaching provision to encourage and support pupils in succeeding in that subject and to make it engaging and relevant. Teaching of mastery in maths is a good example, as is the work on computer science, a big overhaul of the curriculum and the investment in the National Centre for Computing Education.

The other really big, important part of the story is improving the quality of careers advice and guidance. I suspect that you may want to return to this later in the questions, but we need significant reforms to the way in which we provide independent advice and guidance, increasingly making sure that that is happening not after GCSE but earlier in pupils' careers, and with a big STEM engagement focus as part of that work.

Q365 **Chair:** Robin Walker, what do you think are the big things that could make a big change?

Mr Walker: Part of it is about culture; part of it is about that point that you have just made, which is borne out by the grades: that there is no one who cannot do science, physics and computing, and we should not accept any suggestion that there is. We should be making sure that these are aimed at all pupils of all characteristics, and there is no assumption

that there are certain subjects for boys and certain subjects for girls, for instance.

It is also very important that we have that early discussion about careers and opportunities, which underpins the importance of STEM for so many people. One of the things that we put in our White Paper is that we want to see more of a careers programme at primary, rather than this being something that happens only in secondary schools.

That is crucially important, but it is also about getting the building blocks right. One of the things that is a concern and stops many people accessing the more advanced parts of the science and computing curriculum is a lack of maths skills and numeracy. We set a target in the White Paper to make sure that literacy and numeracy are really focused on and driven up so that we do not have what some people would call the forgotten third—the third of people who do not reach the expected standard at primary school and then struggle to access the secondary curriculum—but we aim at driving that right up to 90% so that many more children, of all characteristics and from all backgrounds, can access that broad and rich curriculum that we want them to at secondary.

Q366 **Chair:** If everyone can do maths, do you think that everyone should do maths, beyond 16?

Mr Walker: Not necessarily, no. One of the important characteristics of A-levels is choice, and it is really important that people have the opportunity to choose and to specialise. I took module 1 of A-level maths, realised that I was not going to succeed in A-level maths and decided to focus on arts and essay subjects instead.

There is a benefit, and one of the things we insist on is that, where people are continuing their studies to 18, if they have not reached a decent pass grade in maths and English, we want them to continue to study maths and English. That is currently built into our requirements for post-16 study. It is important to recognise that maths is the most popular A-level—when we have choice, it is popular. We also have incentives in the advanced maths scheme to drive take-up of the new qualifications in core mathematics and further mathematics. It is important that we look at how we incentivise, but it should always be a matter of choice.

Chair: Okay, thank you. We will go into a bit more detail. We need to keep the answers short because we have quite a lot to get through, but I turn to Carol Monaghan.

Q367 **Carol Monaghan:** Minister, thank you for your comments, which are quite important, that when girls choose maths and physics, they are incredibly successful at these subjects—a message that has to be sent out loud and clear.

However, we heard different messages earlier in this inquiry, notably from Katharine Birbalsingh, who talked about the hard maths in physics putting girls off. That was only one person, but these prejudices do exist.

Are they causing problems for changing the landscape in terms of girls into physics?

Mr Walker: Where assumptions are made, they often need to be challenged. Ms Birbalsingh is a highly experienced headteacher; I am sure that she is reflecting what she has heard from students, rather than necessarily giving a personal opinion in that respect. But it is important that we demonstrate—and the figures do demonstrate—that girls can achieve just as highly across the full suite of these subjects, and indeed they do.

On the point of physics, it is important to note that in 2019, girls had a higher nine to four pass rate than boys in GCSE maths, and were only just behind in GCSE physics. I do not think that there is any real evidence that there is any reason why people could not progress.

It is fortuitous that, when we think about progression, we are having this meeting in a room named after the only Prime Minister—who happens to be our first woman Prime Minister—to have a STEM degree, which is a good example of how people from any background or gender can progress. It is striking that we have had so many male Prime Ministers and none from a STEM background.

Q368 **Carol Monaghan:** Interesting. I probably would not share your full position on that Prime Minister. You mention STEM. Of course, biology and chemistry are STEM subjects, but is there a difficulty that, in lumping them in with subjects like physics and computing, we are not getting down to a granular level to understand why some subjects are weighted more towards girls—as biology is, and potentially we are missing out on talented boys in biology—and other subjects like physics are more weighted towards boys, with talented girls potentially missing out? I worry that we are talking about STEM generally, rather than getting down to the specifics.

Mr Walker: It is important to talk about both. It is an interesting point, and I was looking at this in advance of this Committee. When we are talking about diversity, part of that is encouraging more boys to take biology or chemistry—or languages, for instance, although I appreciate that that is outside the scope of this inquiry. We ought to be looking at that to make sure that we are making the most of the talent that is available. That talent is shared equally across the sexes, so we ought to be looking to try to strike a sensible balance in recruitment from each subject.

Where that is not happening, we should look at the assumptions that are driving that and take them on. It is a fair point. Biology and chemistry are incredibly important as part of the overall science suite, and I do not think that they are in any way less important than physics, computing or advanced maths. It is important that STEM covers those broad terms—

Q369 **Carol Monaghan:** The point I am making is that sometimes the boys

into biology is missed when we are talking about girls into physics, so I am not—

Mr Walker: I agree with that; we should be equally interested in why that is. If we look at global priorities when it comes to climate change and biodiversity, we will need skills across biology, chemistry, maths, statistics and physics. On all these things, we want to maximise the skills base that we have, and that means reaching everybody, regardless of their characteristics.

Q370 **Carol Monaghan:** Can I get back to the comments made by Katharine Birbalsingh? How did you feel when you heard those comments?

Mr Walker: I think she was probably reflecting a context, as I said, of what she had heard from students, rather than necessarily expressing a personal opinion about these things. It is important that we reflect where there are those assumptions and use the evidence to take them on.

Q371 **Carol Monaghan:** How did you feel? Was it a head-in-hands moment, or did you just go, "Well, that's what people think, anyway"?

Mr Walker: Well, it makes me more determined that we use the evidence to demonstrate that there is no reason why people cannot progress.

Q372 **Carol Monaghan:** So what are the Government doing to dispel this perception?

Mr Walker: We are working with a very wide range of partners to promote STEM, whether that is from primary or in the work we do with curriculum hubs when it comes to maths, sciences and computing, where we are really trying to drive uptake and make sure that we have the best methods of teaching shared between schools. Hopefully, the opportunity of coming before this Committee is an opportunity to demonstrate that the figures do not bear out that girls do worse than boys in these things; they do not bear out that there is any suggestion that people cannot progress in their studies.

Q373 **Carol Monaghan:** You are talking about hubs now. Hubs are going to be relevant only for those that are actually close to hubs, but there are issues that are relevant for every young person. The national curriculum in England has no female scientist represented. What is happening about that?

Mr Walker: It is important that the national curriculum in England is focused on teaching the scientific knowledge, rather than the history of science and teaching about individuals. There are very few male scientists represented in the national curriculum in England. When I go into schools, I see a lot of displays and information about people like Marie Curie and Ada Lovelace, so there is very good teaching going on in our schools about female role models in the sciences and computing.

Of course, the national curriculum is a framework, and it is focused on scientific knowledge that needs to be taught, rather than personalities. But it is important in other areas—when we talk about careers and the reasons for going into STEM—that we use some of those examples, and schools do that very effectively.

Q374 **Carol Monaghan:** Schools do, but the message is wrong when there is no representation. It would be good to hear that there are moves afoot to tackle that.

You talked about the importance of good teachers, but the Government have consistently missed recruitment targets for STEM teachers. Why?

Mr Walker: Across the piece in STEM, we have hit targets in the last few years on chemistry and biology, but the big challenge has been physics—that has been one of the hardest areas in which to recruit teachers. We are looking at some new approaches to that: we have a new pilot, approaching engineers to teach physics, which we are working with some of the subject associations and learned bodies to promote. That is one area where I acknowledge the biggest challenge.

Interestingly, in maths, the picture has been improving; it has been an area where, since the teacher workforce modelling was first set up and we looked at the targets in each year, we have seen a gradual increase—last year was 95% of target. Part of that has been due to the support that we have been able to provide through bursaries, in targeting the right support.

I would be quite careful that in talking about curriculum we look at some international comparisons. If you look at how England fares when it comes to the PISA scores on maths and science, we have done very well—in fact, considerably better than some comparators such as Scotland. We need to be careful to look at the evidence in that respect, but, absolutely, teacher recruitment continues to be a focus.

Q375 **Carol Monaghan:** I do not want to get into a political discussion, but Scotland has done far better in skills like investigative skills and problem-solving skills than England has.

Is there a limit to how far the Government can go in incentives to recruit teachers? You have said that physics is a particular problem.

Mr Walker: We built a system of incentives with the bursary schemes, and physics is obviously right at the top of that list, along with maths and a number of the other STEM subjects, but we are going further than ever before. The levelling-up premium is a new initiative to make sure that we invest in not just recruitment but retention of teachers in these key areas over a number of years and with an incentive to get the teachers to where they are most needed. Unfortunately, it is a fact—

Q376 **Carol Monaghan:** What is the incentive? If I am a physics teacher, what is the incentive for me?

Mr Walker: The incentive is up to £3,000 a year on top of your salary and any support you have had from the bursary schemes during training to be a physics or maths—a STEM—teacher in those areas of the country that need the most help.

Q377 **Carol Monaghan:** Is that enough when industry is offering double?

Mr Walker: It is always going to be a challenge in that respect. Of course, we are doing other things, such as our recommendations to the STRB for £30,000 starting salaries for teachers and for continuing to increase the overall pay of teachers. The point is that these incentives are on top of that, and the levelling-up premium is a new and targeted approach to try to get the expertise to where it is most needed.

Hubs are there to reach out and provide support to other schools. One of the challenges that we have perceived over a long time is that those areas which have struggled educationally for the longest find it most difficult to attract the best specialist teachers, and that is why the levelling-up premium has been created—to try to target that support and make sure we get specialist teachers into those areas and that we keep them.

It is very important that we focus as a Department on retention as well as recruitment, which, as I discussed it in great detail at the Lords Public Services Committee in its inquiry into the public sector workforce, I will not go into now. That is a cultural change that has happened in the Department over the last few years—to really look at the challenges of retention. In that respect, the levelling-up premium is important in that it is a tool for both.

Q378 **Dehenna Davison:** Thank you, Minister, for joining us today. I want to follow up on the point about recruitment, particularly in some areas, like my own part of the country, County Durham, where unfortunately I know from having spoken to a lot of local school leaders that they really are struggling to recruit high-quality teachers, particularly in maths and science.

You spoke a little about some of the incentives, but can we talk a little more broadly about the education investment areas? I believe they were announced earlier this year, in February, to try to focus on some of the areas of the country where, traditionally, they have struggled to recruit good teachers. You talked about the financial package, but what other support will be available to those teachers in these areas?

Mr Walker: We are putting in place a whole range of mechanisms and measures through the education investment areas, and one of those is the levelling-up premium that I have just mentioned. As I said, that is in recognition of the fact that it is often these areas that over time have been educationally left behind for one reason or another that struggle hardest to attract and retain the best teachers. That is why that is going to be targeted to those areas, of which, of course, County Durham is one.

Interestingly, the figures for your part of the world, where I have been to visit a number of schools, show that primary performs quite well in the grand scheme of things. The challenge has been at secondary, and has often been in these STEM subjects, so that is well targeted in that area.

Alongside that, we are looking at some programmes to increase the number of 16 to 19 places where they are needed and where there are gaps in some of those education investment areas in progression. That will be one of the areas there.

On the funding that you mentioned, I am afraid that I do not have the figures in front of me, but that is being provided to support a range of initiatives, particularly focused on numeracy and literacy. The importance of focusing on those areas is all about the gateway to a wider curriculum that it provides. One of the discussions that we had during the drafting of the White Paper was about how we ensure that the focus on numeracy and literacy does not in any way detract from the breadth of the curriculum and the draw towards STEM, or indeed arts, languages and other important parts of the curriculum that we want to see across the piece. It is about the enabling element of numeracy and literacy initiatives.

The final and very important element in the way these things are going to work is that when we are looking at other programmes from the Department's perspective—for instance, capital programmes—we will be prioritising educational investment areas and priority investment areas. It puts areas such as the one you represent high up the list when it comes to other programmes from the Department. New provision, where it is needed, will be an example of that. I recently made an announcement about 15 new mainstream free schools, and up to 60 new specialist schools. The education investment areas and priority investment areas will be given additional consideration, shall we say, or put further up the list in terms of priority when it comes to that new provision.

Q379 **Dehenna Davison:** That is really good to hear. Specifically on the recruitment of STEM teachers, one of the things that we have heard, certainly from a few headteachers and academy heads that I have spoken to, is that the particular struggle is on recruiting subject specialists. They might be able to find someone who is more of a science generalist, but trying to find physics specialists, in particular, is really difficult. Yet we know the passion that those teachers bring to their subjects and the passion that they can instil in their pupils to make them want to go on and continue to study STEM beyond school. On that basis, do you think that every STEM teacher, particularly at secondary level, should be a subject specialist?

Mr Walker: There is a real benefit in having subject specialists, especially when you are looking at, for instance, providing triple science or A-levels in science. But we have to be honest about the fact that we have struggled over a decade—this is not a new thing—to recruit sufficient subject specialists in physics. We therefore need to make sure

that we can deploy some of the scientific expertise from other areas into the teaching of physics and of science more generally. We also need to look at how we tackle the conundrum that we do not have enough people specialising in physics at A-level partly because we do not necessarily have enough specialist teachers earlier on.

That is why we are looking at some new initiatives, such as the Engineers Teach Physics programme. Through that we are exploring new ways to recruit trainee teachers in subjects where there has been a specific shortage. We are piloting a new ITT course, which is designed to support people with an engineering background to teach physics. That is being delivered through six providers and is supported by EngineeringUK, the Royal Academy of Engineering and academic institutions such as the Gatsby institute. That is a good example of where we recognise that there is a problem and a challenge. Paul might want to add to that, because of course this is an absolutely crucial area from the skills point of view.

Paul Kett: Yes. From the skills point of view, and particularly from the college sector, that relevance of the subject knowledge and it being close to what industry is currently using is particularly important in the vocational subjects. In readiness for T-levels, we have invested quite a lot of professional development activity to bring those subject specialist teachers' skills up. We are also looking increasingly to attract people from industry into the college workforce through the Taking Teaching Further programme. There are benefits for those who are mid-career and thinking about flexibility, as the FE college sector is a really great opportunity to give something back and bring those more up-to-date skills back into the college system.

Mr Walker: Another area that is important is one of the ways in which we can invest in the workforce and support professional development through what we call SKE funding—subject knowledge enhancement. That is where someone who, for instance, might have a maths degree but is interested in and has good knowledge of physics could use that SKE funding to train further and enhance their knowledge of physics in order to be able to deploy as a specialist physics teacher. That is something that we already use where, for instance, we over-recruit in biology and chemistry, to encourage people to look at whether they could join the workforce in those much-needed physics spaces.

Part of our approach to retention in general is to keep investing in continuing professional development, and that is a recognition that that is of value to teachers as one of the things that people value in deciding to stay in the profession. We have stepped that up through what we call the golden thread reforms—the early career framework that means that instead of new teachers being put straight into the classroom as NQTs, they are now supported through a mentoring process in their first couple of years in the classroom, and with national professional qualifications we

are investing in the mid-career workforce to develop subject leadership, which will of course include subject leadership for physics.

Q380 **Dehenna Davison:** Carol mentioned the point about incentives and the difference in pay scales between teaching, as a profession, and industry, which can be quite stark, particularly in some of these STEM subjects. Paul, I think it was you who mentioned the importance of early careers advice. Do you think that there is enough careers advice that really promotes teaching as a profession?

Paul Kett: That is an interesting one. The traditional challenge, if we turn back the clock and look 20 or 30 years ago, is that there was probably almost too much, in that children were directed towards the university route at the expense of everything else. Teaching is a really important profession to promote, and whenever I go to talk in schools I talk about the value of teaching to people. It is something that is very aspirational in being able to change people's lives. But, of course, one of the points about getting into schools and talking STEM is talking about the variety of opportunities that STEM opens up and its increasing importance to the world, and one of those absolutely should be to change people's lives through teaching.

Q381 **Dehenna Davison:** A final question from me: clearly, there are lots of different ways in which we monitor the number of people studying STEM going into STEM careers, but do you think that there should be an emphasis in Ofsted inspections to assess equity in subject take-up—not just in gender balance but also socioeconomic background—to allow some kind of proper formalised benchmarking?

Mr Walker: One of the changes in the new inspection framework has been a greater focus on the breadth of the curriculum that is taught, how it is targeted and how we ensure that all cohorts benefit from a broad and rich curriculum. That is something that they take into account. For instance, they tend to look very askance on people teaching to the test or removing particular cohorts of children from a particular subject—quite rightly. So, some of that is taken into account. Where we need to be a little bit careful is making it too data driven rather than based on the overall approaches.

Paul Kett: I will add one point on the way in which Ofsted now looks at the careers framework. In the latest framework, for the first time careers education was recognised and inspected against the Gatsby benchmarks, which include linking careers education to the curriculum. That will drive change by ensuring that the engagement with children is across the breadth of opportunities. A lot of our careers reforms are about recognising that, in the past, teachers themselves were not invested in being the best careers advisers, and recognising that as a specialism. As the Minister said, teachers have had a very particular route to becoming teachers, through traditional university routes, and so are not necessarily in the best place to advocate for apprenticeship routes.

Q382 **Rebecca Long Bailey:** Minister, the Department for Education recently announced a new package of bursaries to attract STEM teachers. What led you to decide on this approach?

Mr Walker: Over the last few years we have looked at where we are recruiting and where there are gaps to fill. It is really based on prioritising EBacc subjects, because we believe that 90% of children ought to be taking those up—I am glad to say that in both maths and science it is above that. Within those, we are looking at those areas where we have a greater shortage of new teachers being recruited. That is why physics, maths and computing are at the top of that list, with chemistry, biology and geography following not far behind. Subjects such as mine—history—do not make the list because we over-recruit in that space, and, important though it is, it is right that we target the additional funding in the bursaries to the areas where there is the greatest need.

Q383 **Rebecca Long Bailey:** What evidence have you collated from previous pilot schemes to suggest that the bursary scheme would work?

Mr Walker: We looked at the evidence on both recruitment and retention, and there is a correlation between the bursaries that are provided and the increase. We have to be frank about the fact that the big challenge with physics is that, despite the use of bursaries, we have seen, year after year, a shortage of teachers. The way in which we model cumulates that, so it makes the target higher in the following year for how many you have to recruit.

That is the big challenge, and it is why we have to try new things, such as recruiting physics teachers from engineering, as a pilot, and the levelling-up premium. One of the things that I was very keen to ensure was that the levelling-up premium did not just look at the entry, because otherwise there is a risk with bursaries that you incentivise people in their first year, but when those incentives drop away it is easy for them to leave. A multi-year element of funding follows those teachers over the first few years of their career so that they continue to benefit from that beyond the entry point.

Q384 **Rebecca Long Bailey:** Of course, one other option would have been to consider ending the need to take a loan to cover the cost of a PGCE or any teacher training. Why was this discounted in favour of bursaries?

Mr Walker: There has been very little evidence that the loans actually disincentivise people from entering the profession. It is important that the loans are treated consistently with other higher-education loans. We need to make sure that we are constantly looking at which incentives work and what can make a real difference in that respect.

It is also important that we are able to recruit teachers in a competitive landscape and in a competitive market with other areas. It would not necessarily be right to treat the teaching workforce as entirely different from other areas that benefit from tertiary education.

Q385 **Rebecca Long Bailey:** You have already discussed education investment areas. Surely the aim should be to raise the standard of teaching for children everywhere, rather than just in specific areas.

Mr Walker: Absolutely; it is, and it should be. Our White Paper on having an excellent teacher in every classroom is very much a focus of that—following the evidence, doing what works and making sure that we have a shared base of evidence. One of the things that I was very pleased to secure through the White Paper was the continuation of the Education Endowment Foundation, which has been one of the very positive things over the last 10 years, creating a base of evidence that, despite all the many political discussions and debates we have in the education space, everyone from all sides can agree is impartial and valuable for looking at what works in teaching. It was endowed by Michael Gove 10 years ago but has now been re-endowed to make sure that it can continue its work. It is well supported by the unions as well as by all sides of the education debate.

It is important that we follow that evidence, and if we look at things like the early career framework reforms, the golden thread reforms I mentioned earlier, and the investment in NPQs, that is universal—it is not just targeted to education investment areas. Education investment areas are an example of where we can then take a targeted approach to make sure that areas that have previously and over a long period tended to under-perform have an opportunity to catch up.

Q386 **Rebecca Long Bailey:** How will you measure the success of education investment areas?

Mr Walker: We want to see a closing of the gap. For instance, within that aspiration that we raise to 90% the current two thirds of children who reach the expected standard at English and maths at the end of primary, we are setting an aspiration that for disadvantaged children—who, of course, are over-represented within the education investment areas—the rate of increase should be faster. We want to see attainment raised by one third in those disadvantaged cohorts. Many of the other mechanisms that we are using—whether the pupil premium or the recovery premium, which is doubling for secondary schools in the next year—are targeted at trying to achieve that more rapid improvement for children who are disadvantaged.

Q387 **Rebecca Long Bailey:** Thank you. It is interesting that you should talk about aspiration. The chair of the Government's Social Mobility Commission recently said that working-class and disadvantaged children should take "smaller steps" before aiming for Oxbridge. Would you agree with that?

Mr Walker: I want everyone to aspire to their maximum potential. I think what she was really saying was that we should celebrate the small steps of progress that people make more than just the moonshot stories and rags-to-riches stories. I think we should celebrate both. At the end of

the day, we should celebrate social mobility and progress, and the achievements that people make to progress. I do not necessarily disagree with her in saying that we should also celebrate the small things, but I do not think that she was discouraging people from aspiring.

Q388 **Rebecca Long Bailey:** The statement was quite clear to me, unfortunately.

You have spoken to my colleagues about the incentives that you are using to try to recruit new STEM teachers and to retain existing ones, and I do not want to add to what they have said already, but I have a very simple question: are teachers being paid enough?

Mr Walker: One of the reasons why we have gone to the STRB with proposals for an increase is that we recognise that this is a highly qualified profession with high professional standards, and we want to increase that. What we have proposed, particularly in entry-level pay, is a very substantial increase—it is something like 16% over two years. That process is still ongoing; we want to hear back from the STRB as to what they think of our recommendations, but I have been clear and, fortunately, the spending review gives us the opportunity to deliver a pay rise for the teaching profession.

Of course, as we all know, that is in a context that is very difficult when it comes to inflation. I want to see us deliver on that; I am glad that we are no longer in the position of a public sector pay freeze, and I want to make sure that we can deliver the promise that we have made of £30,000 starting salaries for teachers.

Q389 **Rebecca Long Bailey:** So you think that teachers are being paid more than enough, then.

Mr Walker: I certainly did not say that. We have put in a sensible package of proposals, and I look forward to getting the feedback of the STRB on that.

Q390 **Rebecca Long Bailey:** Could you elaborate a little more on the steps that you are taking to try to dissuade teachers from going into the private sector, where they are offered far more salary?

Mr Walker: I do not think that we should be in the business, necessarily, of disincentivising people from looking at what their options are, but we should be making sure that the state education sector, which is highly successful in this country and much larger than the public sector in many of our European comparators, is competitive and effective in that respect. What I have talked about—the focus on teacher retention, the investments we are making in continuing professional development for teaching, and things like the levelling-up premium and the bursaries—are all investments in making sure that we have a really competitive sector. The school system reforms that we set out in the White Paper will also be helpful in that respect, because they offer a greater career progression to

many teachers when they are working in families of schools. There are real opportunities in that space.

If we look overall at the position of this country and internationally, we are able to attract teachers from overseas partly because we have a highly respected education sector in this country. Talking to colleagues at the ISTP, the International Summit on the Teaching Profession that I attended in Valencia with the teaching unions, where we were meeting 14 countries from around the OECD, I was quite struck that in the UK the independent sector is very much smaller than in many of our European comparators, such as Spain, the Scandinavian countries and others that were represented at that forum.

It is good that we have both, and that they are both strong, but my job is to make sure that the state education system continues to be a very attractive place to work and to attract the best teachers.

Q391 **Rebecca Long Bailey:** I will take it down to a human level for my final point. You have a chemistry teacher who went into the profession to deliver results for their pupils, who is dedicated to trying to improve the living standards and life outcomes of disadvantaged pupils, but they are offered a very well-paid job in the private sector, and they are struggling with what to do. What would you say to them today?

Mr Walker: I would say, "We will continue to invest in you and your professional development, we will continue to make sure that we have one of the leading education sectors in the world and in Europe, we value your skills in STEM and that is why we are prepared to invest in them with bursaries and the extra support from the levelling-up premium, and you can make a huge difference to people's lives by staying in the sector and working with pupils. We want to give you the professional agency to do that in the most effective way, and make sure that we have an education system that supports you, gives you the tools to do the job and gives you extra support when you are supporting the most disadvantaged pupils." That is absolutely the priority that we continue to progress, particularly with regard to STEM, where there are such great opportunities for people if we can secure the right education.

Q392 **Tracey Crouch:** I sat on the Lewis Hamilton commission that looked at black students' attainment in STEM subjects. It showed very clearly that they under-achieve or their attainment levels are much lower than those of white students throughout the process. It identified some areas of concern, in particular the barriers, such as streaming of young black students into lower ability groups, behaviour management practices in schools, a lack of black teaching roles and limited activities in schools to address issues of race inequality. I wonder whether you have had the opportunity to read and reflect on that report, and whether you have any views about the fact that we are still seeing a lower proportion of black students get the top grades at both GCSE and A-level in STEM subjects.

Mr Walker: This is a very important question. I will admit that I have not read the report, because I suspect that it came in before my time in the Department, but I will go away and read it now because it is important that we look at this and at how we can support everybody, regardless of their characteristics and whatever their background, across the system to have no limits on their aspiration. It is interesting that, looking at the issue of ethnicity, we do not break down as a Department A-level and GCSE performance by different categories, but if we look at take-up, at A-level, pupils of Asian, Asian British and Chinese heritage are very well represented across STEM subjects, and black African pupils are well represented in biology, chemistry and maths compared to other subjects, but we acknowledge that pupils of black African heritage are under-represented in further maths and physics, and pupils of black Caribbean heritage are under-represented across all STEM subjects. It is right that we should look at how we can address that.

It is important that what we set out in the White Paper is an aspiration for pupils from all backgrounds to have access to excellent quality, inspirational teaching across a broad and rich curriculum, and we should be constantly making sure that we are focused on how we can achieve that. So, I will go away and read that report. Paul, who has been in the Department for slightly longer than I have, can probably give you a further—

Chair: I think we need to move on to the next question. Aaron Bell.

Q393 **Aaron Bell:** Thank you, Chair, and thank you, Minister, and Mr Kett as well.

I want to go back to subject choices and elements of what should be mandatory. I think you said earlier to the Chair that you did not think that maths beyond 16 should be compulsory. We have heard the suggestion of at least studying one STEM subject, maybe not to A-level itself but to a lower level, beyond 16. What would your thoughts be about that?

Mr Walker: I have to say that I take the view that the opportunity to specialise and pick your options at 16 is valuable and is valued by students. We should ensure that people meet a minimum standard in the key enabling subjects—maths and English—which are important, and we do that through the design of many of our programmes. It is not right that we should specify beyond that what particular A-levels people have to study post 16. Of course, I recognise that other jurisdictions do, but it is one of the strengths of our system.

One of the things that we are looking at, and which can help to drive the take-up of STEM more generally beyond 16, is giving greater parity of esteem to qualifications in a vocational space. Of course, the T-level programme is very much designed so that we have a gold standard in that space akin to what A-levels offer in the academic space. Paul really

should come in on that front because that is very much his area of expertise.

Paul Kett: Before I do, I will add one point on the specific question on maths and core maths that was mentioned earlier. A new level 3 course that can be taken alongside A-levels and is recognised and welcomed by a number of universities thanks to the work of the Royal Society Advisory Committee on Mathematics Education is a really good example of those wider choices.

Q394 **Aaron Bell:** What is the take-up on that?

Paul Kett: I think it was about 12,000 last year, which is relatively small numbers, but we are still trying to promote it, working with universities but also as a choice for adults who did not secure a level 3 qualification; it is one of the courses available through the free courses for jobs offers as well. Because it has that more applied approach to maths, it is a really positive piece of provision.

On T-levels, we are in the early days, but they have a very particular STEM focus. The first three are now being taught, in digital, healthcare and science, and construction, and, from this September, we will see engineering and mathematics. These are really high-quality and vocationally focused but with a core component which will equip people with the knowledge that they need in those subjects. My Secretary of State has said very clearly that he wants to make them as famous as A-levels. We are looking forward to the first T-level results this summer of the first cohort of about 1,000, and they will be scaling up over the coming years. We are putting a lot of investment in, both in professional development, as I mentioned previously, but also capital equipment and placements of 45 days with employers, and certainly the STEM employers that we see are really excited about that opportunity of bringing young people into their workforces and progressing them on to apprenticeships.

Q395 **Aaron Bell:** Thank you. Professor Tillmann from the London Mathematical Society was one of the ones who suggested the promotion of core maths to us. She also suggested that we might want to consider introducing a foundation year for mathematics for people who have perhaps taken the wrong choices, in retrospect, at A-level, and want to go and do a degree where they would benefit from maths. Is that something that the Department could look at or support?

Paul Kett: Rather than a foundation year per se, one of the things that I would point to is the reforms to level 4 and 5 provision—sub-degree provision—and the opportunities for people to take more modular approaches. A foundation year in mathematics alone would feel like it was asking too much of people, or it would not be at the level required. It would be better to give people the opportunity to study, for example, core maths alongside other A-levels. I know that many universities teach additional maths in their first year anyway, particularly in core science subjects like physics and so on in order to make sure that those who

perhaps did not have further maths as well as maths A-level are successful.

Q396 **Aaron Bell:** Thank you. Minister, going right back to a period when children do not have any choice, in primary education, do you think the removal of key stage 2 SATs in science was a mistake, because it leads to children going into secondary school not seeing it as being as important, perhaps, as maths and English?

Mr Walker: This is an interesting debate and was one of the things that I was talking through with officials before this Committee. I think that the consensus, including in the teaching profession, is that primary science is very important and needs to be an opportunity to inspire children, and that there is not necessarily a benefit of introducing a test that would then be taught to at that stage, versus ensuring that science is delivered in every school and is assessed—it is currently teacher-assessed.

Q397 **Aaron Bell:** Sorry to interrupt. It was the science subject leader at Ofsted who told us that the removal of key stage 2 had coincided with a potential de-prioritisation of science—so the people we send in to examine how well science is being taught in primary schools are saying that the removal of the test is perhaps a problem.

Mr Walker: I totally recognise that Ofsted will always want as much data as they can get on this. What I am saying is that if you talk to the profession more widely, you will perhaps hear a broader range of views on that. It is really important that we recognise that the key enablers of progress in the whole curriculum, including in science, are numeracy and literacy, and it is right that the key stage focus is on those primarily. But of course it is important that science is taught, and taught well, in primary schools, and we are putting huge emphasis—for instance, in the new model curriculum for primary science—on demonstrating how that can be done in a way that is really inspiring and inclusive. That is a big priority for us. I do not think that reintroducing further key stage 2 SATs would necessarily be helpful in ensuring that we have the breadth of teaching for science in primary school.

It is also really important that we lay the groundwork really early. There is important work going on in the early years as well, both in understanding numbers and in the element of the early years foundation stage that is about understanding the world around you. One of the things I did in preparation for this Committee was to ask my four-year-old daughter, who is at nursery, what she had learned about science. She told me that she wanted to be a "potionist" when she grows up, which I am not sure is very specific scientific knowledge, but it at least shows that she has been experimenting.

Q398 **Aaron Bell:** My five-year-old little girl likes making potions as well.

We have already heard about the Hamilton commission and Katharine Birbalsingh said in her evidence to us that she totally believed in role models as well. Do you think that schools need to be given more

assistance with bringing in STEM professionals, whether it is research or industry professionals, to contribute to the careers advice in their schools?

Mr Walker: Yes, but there is a lot of great work going on in that space, and there are a lot of networks supporting that, whether it is Young Enterprise, the Careers and Enterprise Company, people like WISE, and so on and so forth. There are a lot of very strong networks offering that support to schools. Really importantly, it needs to be well co-ordinated and well organised. The careers hubs are really important in that respect, and I am very lucky that in my neck of the woods, in Worcestershire, we have a fantastic careers hub that is working really well with the private sector to bring in great examples of people in STEM careers. Paul will probably want to—

Q399 **Aaron Bell:** Could you just expand on that and say how we are making sure it reaches every school?

Chair: Briefly.

Paul Kett: First of all, the careers hubs will be rolled out across all schools—we will hit 90% of schools in 2023. Specifically, I draw the Committee's attention to the STEM toolkit that was developed with STEM Learning and the Careers and Enterprise Company, which does that navigation point. There is a huge amount of really effective aspiration and engagement activity out there. Schools told us that it was hard to access; that kit makes it very easy to access.

I would also highlight some of the employers who act as kind of cornerstone employers, like BAE Systems, which have very significant numbers of their staff going in as enterprise advisers to support in schools. That makes a real difference—we have been seeing that.

Aaron Bell: Thank you very much indeed—that is good to hear.

Q400 **Chair:** Thank you very much indeed. I will put a couple of final questions, if I may, to the Minister. You said that everyone can do maths and we know, from the evidence of this inquiry and others, that we have a real shortage of people studying STEM and having qualifications, and a big opportunity to get more people educated in that way. On core maths, why would you not at least have an expectation, if not a requirement, that everyone post 16 studies core maths in addition to whatever A-levels or T-levels or other qualifications they are doing?

Mr Walker: We have a system in this country that allows people that choice and that focus. Core maths is an excellent addition to allow more people to take maths alongside other subjects.

Q401 **Chair:** "To allow." Do the Government not have a view that they would like more people to study and be educated in maths—

Mr Walker: That is why we have a programme of support for people taking both core maths and further maths forward.

Q402 **Chair:** But only support—you do not feel any motivation to push it further, to give people a nudge, to have an expectation that people will do maths beyond 16.

Mr Walker: We have the motivation to make sure that people have the maths that they need to progress, but not necessarily to make sure that everyone at 16 has to choose to take it forward. That is where I would strike the balance in terms of—

Q403 **Chair:** So it is a mild preference for more STEM—is that about it?

Mr Walker: No, it is not a mild preference. I have talked a lot about all the things that we are doing to promote STEM, and the fact that things like EBacc have made a real difference to the take-up of STEM subjects and people's opportunities to advance in STEM. We do have a programme of incentivising and supporting advanced maths, which includes that core maths. But I would not be inclined to restrict the choice of students to specialise at 16.

Q404 **Chair:** We will come to that. It is not to restrict; it is to encourage people to do core maths—that is to say, to do sub-A-level, but more maths beyond 16.

Mr Walker: We do encourage people to consider core maths and to look at that as an option; it is important we do that. We also encourage people who are taking maths to look at the option of adding further maths and look at further enhancing their skills. For me, that feels like the right balance to strike, but I recognise that, with a specific focus on science and technology, this Committee will always push for us to go further.

Q405 **Chair:** All right. On the specialisation into three subjects at A-level, which you have given a strong defence of, you will have read this morning that *The Times* has published the findings of an education commission, in which it calls for a British baccalaureate that would consist of studying six subjects, comprising science and humanities, up to age 18, with three in detail. Do you not favour that? Are you against that?

Mr Walker: I am not against that; I will look at it carefully. Obviously, I have not had the opportunity to digest it in full as a proposal. Of course, we have some schools, both in the state sector and the independent sector, that are looking at the international baccalaureate and looking at that offer—

Q406 **Chair:** Do you welcome that? Would you like to see more of that?

Mr Walker: That is something that we allow for, support and recognise. The overall system that we have in this country, with GCSEs and A-levels, absolutely supports and insists on that breadth of study up to the age of 16, but then allows for greater specialisation. That is something that I support broadly continuing.

Q407 **Chair:** You mentioned that the international baccalaureate takes place in

state schools and private schools.

Mr Walker: Yes.

Q408 **Chair:** Do you favour that? Do you think it is a good thing? Do you have a preference for people studying the IB against A-levels? Do you regard one as better than the other?

Mr Walker: No, I do not think that it is our role to express a preference in that respect, but we have ensured that that can be recognised and succeed alongside A-levels. Paul might want to—

Paul Kett: The only thing I was going to add is that, in terms of A-levels themselves, they were recently reformed to ensure that the content of them was that which was demanded by employers and higher education institutions, so they are a very high-standard qualification—

Mr Walker: And internationally respected and embraced by other jurisdictions beyond the UK as a bit of a gold standard. In that respect we should also recognise the value of what we have, as well as new proposals, and if those proposals get support from employers and universities of course we should look at how we can recognise them and allow them to grow.

Q409 **Chair:** Do you have any plans to respond to the Times Education Commission?

Mr Walker: I have met them previously and will continue to engage with the Times Education Commission. I know that my Secretary of State is also engaged in a number of conversations with them.

Chair: Thank you very much indeed. I thank the Minister and his official, Paul Kett, for kicking off the session this morning.

Examination of witnesses

Witnesses: Kemi Badenoch MP, Gillian Unsworth and Marcus Bell.

Q410 **Chair:** I am delighted to welcome Kemi Badenoch, Minister of State for Equalities at the Government Equalities Office. Thank you very much, Minister, for joining us.

The Minister is accompanied by two officials: Marcus Bell, Director of the Equality Hub in the Cabinet Office, and Gillian Unsworth, Head of Gender and Workplace Equality at the Cabinet Office.

Minister, thank you very much indeed for coming to give evidence to us today. You are aware of the context of our inquiry and the interest we have in extending the take-up of STEM. I hope you do not mind if we start with your example, because you studied STEM at university. Tell us a bit about your background in that.

Kemi Badenoch: My first degree was in systems engineering. I did a four-year MEng at the University of Sussex. I find the conversation around getting more women into STEM really fascinating, quite often because many of the people who discuss it did not do the subject themselves. They had their own stereotypes and views about what it was actually like.

My year at university had about 300 people, of whom only six were females. Of those six, only one was what I would call white British. The rest of us were international students or first-generation immigrants like me.

Q411 **Chair:** For exactly the reason you give, I am particularly interested in your experience. To take it back a bit further, your schooling got you into a position where you were able to effect a choice to study engineering at university. I think that you studied up to 16 in Nigeria. Is that right?

Kemi Badenoch: That is right.

Q412 **Chair:** And from 16 to 18 in the United Kingdom?

Kemi Badenoch: Yes.

Q413 **Chair:** Did you experience any difference in the way they do things and the educational culture between the two settings?

Kemi Badenoch: It is fundamentally different. STEM courses in developing countries are looked at as opportunities to earn well and make money. We had tests. If you got above a certain score, you were put into the science class; if you were below, you were put into the non-science element of the class, so there was already a stereotype that the smart people did science and engineering, medicine and so on, and the ones who were not smart did whatever else they wanted to do. That in itself had an impact on the numbers of people going into particular courses. It is not something I would advocate, but it is a different cultural attitude.

Q414 **Chair:** People like you were steered into STEM.

Kemi Badenoch: We were steered based on test scores, which had its own negative effect because lots of people who did not want to do those things ended up going down the wrong career track. I do not think that mandating things is a very good idea, but there are also cultural factors in what people themselves see as the purpose of university in particular. Obviously, this is anecdotal not just from growing up in Nigeria but from meeting lots of international students and British students at A-levels and university. Where there is a cultural belief that university is the place where you go to find yourself, to discover, to enjoy and meet lots of people, there is less push towards women in particular doing STEM courses than is the case with families and cultural backgrounds where university is the place to go to get a job, get on, support your family and send money home. You need to do something that will definitely earn you an income. Those things also have an influence.

Q415 **Chair:** In terms of both the steer and cultural context that you describe favouring STEM, or giving prestige to that, did it apply equally to boys and girls in your experience in Nigeria?

Kemi Badenoch: Yes, it did. It is also cultural. The part of the country I grew up in has a lot less gender discrimination than you would have had in northern Nigeria, where it is very different.

Q416 **Chair:** When you came to the UK for the end of your secondary education and the sixth form, how did you find the culture and structure when it came to the choice of subjects?

Kemi Badenoch: You use the word "prestige". The prestige element did disappear. There was prestige. I think you find this a lot with Indian, Pakistani and west African families, for example: "My child is a doctor, an engineer and so on." There is family prestige and expectation that comes with that.

When I came here, talking to teachers was fascinating. My parents were doctors. "Why do you want to do medicine? You could do something else. It is quite tough." They emphasised that these were really difficult subjects and if I wanted to pass I might want to do something easier.

Q417 **Chair:** That is interesting. Whether sciences are harder has been quite a theme in this. That was reflected in your experience at university.

Kemi Badenoch: Yes, definitely. This is between 1996 to 1998; that was when I did A-levels, but they did say, "There are some easier things you could do not just in terms of the subjects, but maybe GNVQs instead of A-levels. Let's help you get the easy things and do well."

Q418 **Chair:** But you insisted. I assume you did STEM A-levels in order to do a STEM degree.

Kemi Badenoch: Yes. Even then, my family expected me to be a doctor. One of the things that was great about being here was that there were so many more options. When all those options were presented, I thought that maybe I could do something else.

I was also influenced by the fact that medicine was one of the toughest things to get into, so I started looking at other options as well. Therefore, it did have an impact, but I did not move away from STEM courses, not just because of what my family had done but my peer group. Everybody else I knew from school was doing similar things and I did not want to be an outlier. There is peer pressure as well in terms of what your friends do. I have seen this when mentoring younger girls. What your peer group is doing and what you see when you go into the classes has an impact.

The GEO has some research that girls are more likely to drop out of their course if they are a minority on it, so there is already a bias in the numbers, and when you are the only girl in the class that is also a discouragement, so peer group influence is important.

Q419 **Chair:** You went to university to study software engineering. Forgive me for saying this, but it was exactly as you said. You have the experience that many people commenting on this do not have. You went into a cohort of people who were overwhelmingly men, as you have described. How did that feel? Did that trouble you?

Kemi Badenoch: It was certainly more male then I was expecting, but something else happens. When you are a minority to that degree there is also a positive effect. Everyone knew who the girls in the class were. It was almost special treatment in just getting extra support. People would ask how we were doing. I do not know whether that influenced me in feeling that this is something that was not quite right, but I never really felt it was an odd situation beyond thinking, "I guess that lots of girls do not like doing this course."

Sussex University has a huge humanities department. It was the opposite. We would laugh at the boys who were doing those courses; they were the only boys in their year group, but we did not feel that there was a discriminatory element. A lot of personal preference had gone into our choices, and you do not necessarily understand how much cultural or peer group influence there is until you are much older and look back on it.

Q420 **Chair:** When it comes to the subject matter, it hardly requires saying, but, given the differences there, the experience of software engineering and indeed computing early in its development is that you had more women than men. It seems to have converted into something that is so male dominated. There seems to be no reason why that should be the case.

Kemi Badenoch: There is an explanation. If I draw on personal experience, one of the things that influenced me in picking that course was that when I was seven my father bought me a ZX81 computer. You had to type in all the code yourself in order to play the game, so I learned by rote. Before I started university I had already picked it up, and occasionally I would do a little bit of coding here and there. I already had quite a bit of basic coding knowledge before I went in.

What happened to me aged seven to 16 was as important as the courses that I picked at A-levels and at university. I think that the advent of the personal computer changed things. When you look at the history of computing, with punch cards it was pretty much 50:50. A lot of women did it and computing was almost clerical work. Once computers went into bedrooms, boys had an advantage, in the sense they were far more likely to be sitting in front of a computer in their room playing games and writing code. I think that had a huge influence.

Given that now very few people have to do anything like that in order to play games—they just go on the internet and it is all there—I do not know whether that still has an impact, but I think that a big game

changer was the personal computer and what people were doing at home before they got into education in the first place.

Chair: Thank you very much indeed for that. Certainly, Sir Clive Sinclair has a lot to be proud of. That was my introduction to these things.

Q421 **Tracey Crouch:** That was a really fascinating insight into the cultural differences between studying STEM subjects in Nigeria and here. I am particularly interested in your comment that, if you want to make money, you study STEM in Nigeria. In this country, it is almost the complete opposite.

The discussion about improving diversity and inclusion has been a long-running one. How can we prevent a successor to this Committee in 10 or 20 years from now still talking about diversity and inclusion in STEM?

Kemi Badenoch: I think that not having the same conversation over and over again in the future depends on whether you are trying to stop us going backwards, which is critical—we can do something about that—or whether the goalposts move and what people count as diversity and inclusion in 10 years' time is different from how we are defining and measuring it.

Being as empirical as possible, what is it we are trying to achieve in diversity? If it is getting absolute parity where the number of people represented in certain courses is exactly the same as their representation in society, I do not think we will ever get that, but making sure we are constantly improving and not going backwards is absolutely key.

Q422 **Tracey Crouch:** Do you think we are going backwards?

Kemi Badenoch: I do not have any evidence off the top of my head regarding STEM. I do not know whether Gillian has any facts, but I do know that on things like women on boards we have done well and then gone backwards. What we need are sustainable initiatives and schemes rather than a lot of temporary things where companies will try to meet a target and, once it is achieved, stop looking at things like pipelines, for example, which are absolutely crucial. It is about making sure that the pipeline is always looked at in getting people on to courses and work and making sure that workplaces are inclusive and encourage people to stay on. The Government come in on pay, conditions, flexible working, childcare, etc. All those things will be at the other end of the pipeline, but ensuring that people are going into these courses and workplaces needs constant attention.

Q423 **Tracey Crouch:** Improving the pipeline is quite a long-term ambition; it takes time. What interventions can government put in place now to make sure that pipeline is happening? How do we measure short-term success? How can government put those interventions in place to measure success? Are we talking about targets?

Kemi Badenoch: You can use targets, but they often have unintended consequences. I would say that it is a little bit of everything: some education in letting people know what their options are is absolutely critical; and targets to make sure that companies do not ignore the problem, but targets that encourage them to game the system and do something weird is not resolving the problems that need to be solved and is not the intention.

Again, it starts at the root cause, which is: what opportunity is available for people wherever they are? Our focus is on equality of opportunity, making sure everybody has equal opportunities. One of those barriers to equal opportunities is prejudice and discrimination, but there are many others. There are cultural barriers and geographic issues. You live in a town where all the schools are terrible and there is no work. There are barriers around education and understanding.

I tend to find that today one of the problems is that everybody is looking at that first pillar. It is all about prejudice and discrimination and not about all the other things that you need to remove to get equality of opportunity. It is about making sure there is a levelling-up agenda and we are looking at the educational opportunities, geographical disparities and things that government broadly can do to help.

Q424 **Tracey Crouch:** Prejudice and discrimination are still prevalent. We heard in this Committee from Claudenia Williams, assistant principal at Kingsley Academy in Hounslow. She told us that she sat an interview for a senior role and was questioned about her view of black history. She was the only colleague to have had that question directed at her. She was further probed about why that had any relevance to society today. That discrimination does exist and I would be quite interested to know what government interventions are occurring to address that sort of thing, particularly when we are looking at role models for students to go into STEM.

Kemi Badenoch: It is an odd question for anybody to be asked in an interview. It does not seem to be particularly relevant to STEM or teaching, but some of these issues arise because the more we talk about race, prejudice and discrimination in a particular way, the more we segregate people into groups and create stigmatisation. There is no reason why anybody should be asked a question based on the colour of their skin in any interview. We now have almost the opposite problem where people think they are being positive about it in raising this topic. We are trying to be culturally competent and sensitive but end up making the person feel different and isolated.

You ask what we're doing about it. We launched "Inclusive Britain", which is our racial equality and inclusion strategy. In that report we talk about a lot of actions we are taking to help to educate. Education is a huge issue in how people look at diversity and inclusion. There is no standardisation at all. There is no body that officially looks at what people are doing. I have found one problem in talking to lots of organisations. I had one

meeting yesterday. Everybody is doing their own thing. Some of it is really good; some of it is absolutely awful, and there is very little empirical evidence used in determining how they are doing their training. That is something we are looking at within our inclusion at work panel, trying to get some standardisation and clarity, especially for smaller organisations. The big corporates tend to have fewer problems around this than small to medium organisations.

Q425 **Tracey Crouch:** I know that you read the report of the Lewis Hamilton commission because we discussed it, having sat on it. One of the barriers the commission identified for why black students did not go into STEM subjects was the lack of role models, but also an underlying sense of racism and discrimination within academia. Having read that report and seen the statistics, recognising that there are fewer black students throughout the entire school process—it does say that in higher education there are lower attainment levels in STEM subjects than those for white equivalents—how do you think we could address that imbalance not just in students taking STEM subjects and achieving in those subjects but having a small number of black role models in STEM subjects?

Kemi Badenoch: The question about role models is an interesting one. When we talk about role models we tend to think of a famous person or someone you have seen on TV who is doing something, but the evidence that we have shows that it is more about role models within your immediate community. For instance, I talked about my family, who had a huge influence on me. That was far more important than anything that any teacher or anybody on television could have done.

There is a structural challenge there because we cannot replace who is in someone's family or community. Having some of those visible, high-level role models is important, but encouraging people to be able to see themselves in someone who does not necessarily look like them is also important. I do not want to be seen as a role model for just black children; I want my white constituents' children to see me in the same way as other people would see me, so making sure we are not overly emphasising race as a cause of difference in our national discourse is absolutely critical.

I also think it is about organisations making an effort to ensure that when they have a leadership team or when they are employing they make sure that they are representative of the communities in which they are teaching or working.

On the second part of the question, there is legislation to deal with the genuine prejudice and discrimination people encounter in the workplace. I think that the legislation is deficient. Within the Equality Act there are supporting bodies: the Equality Advisory Support Service and the EHRC for even more serious cases can help to prosecute where things have gone badly wrong.

Quite often, the things that people experience do not meet the threshold for prosecution. It can just be a feeling that people around you do not like you. You cannot take them to court for that. It is a very difficult thing to see. I do not think you can legislate for feeling, but what you can do is continue to promote discourse and language, which is what we have done with "Inclusive Britain", explaining what a cohesive society looks like and encouraging companies by way of rewarding those that are doing well, or individuals who are doing well, and Government recognising those people who are making a difference in their community.

Many of those things go a long way to addressing how the workplace should look and the kind of people we value in society, but making sure that no one anywhere is prejudiced is a much tougher thing. It also starts very early and how we teach children at school. Those are some of the things we are trying to bring together in that "Inclusive Britain" package. We are looking at a model history curriculum, for instance, and how we get materials for things like Black History Month and the point you were making about that headteacher so that people are not just googling things and getting lots of stuff that is relevant to the US, for example—making sure it is relevant not just to ethnic minority children but everyone. It is shared history and value; we share the same country and we want that to be the case for everybody.

Q426 **Carol Monaghan:** Minister, we are all enjoying listening to your experience of growing up and how subject choices were made. You have talked about your experience of how you came to study computing, but how do children's characteristics, be they gender, ethnicity or socioeconomic status, impact on the subject choices that they might make?

Kemi Badenoch: I think we have some data on who is represented where, but we have to disaggregate what we mean by "ethnic minority". We stopped using BAME because it was mixing up too many different groups into one category. You also have to disaggregate STEM. Girls studying biology are very different from girls studying engineering.

Carol Monaghan: We had that discussion with the previous panel.

Kemi Badenoch: Exactly. If you disaggregate that you can see certain trends.

I am less worried about where there is particular representation here or there. I am worried about where there is clearly a barrier and something is going wrong and that is around disadvantage, which is the same whether you are male or female or whatever the colour of your skin. Disadvantage is what really discourages or stops people; it is the structural thing that stops people getting on to any particular courses. I do not have any numbers off the top of my head. We did have some numbers on what we discovered, and it is fitting into our equality data programme and levelling up in terms of what we can do to fix that.

Gillian Unsworth: It is the complexity of the picture that makes it difficult to tackle or to lay the focus of what we are doing, which is causes of the disadvantage and where we can make a change that will remove that disadvantage. Previously, we were talking about interviews. There is a lot of research on how interviews are conducted and standardising elements of the interview, like the questions, the panel and making sure that every candidate is treated exactly the same. That has a much stronger effect than trying to attract more Bangladeshi students into a specific area.

Q427 **Carol Monaghan:** Let us take it back to ages 13 or 14 when a young person is making their initial subject choices. You talk about the barriers rather than the choices. Maybe that is how we should be considering it. What are the barriers? How do we overcome them, and how do we tackle that?

Kemi Badenoch: I think there is some evidence that we pick too early in terms of the courses so that before people develop the confidence to do certain things they are already on a particular track. I am not a DFE Minister. Much of it is from what I have read and personal opinion about how we can tackle that, but giving people later opportunities is critical. It is about second chances and having things like degree apprenticeships not necessarily based on the particular age you are at but being able to go back and try again if the first time it did not work well for you.

Employers providing training opportunities is absolutely critical. We cannot catch everything within the school system; we need everybody else to lend a hand, and I think that employment is one way where problems that have not been fixed for whatever reason can be recognised.

Marcus Bell: If you are in a family where going to university is routine, if I can put it that way, you will get lots of advice from your parents at ages 13 or 14, whether you want it or not, about your choices, what the implications are, what you should choose and consider and so on. Lots of kids do not get that from their parents either because their parents do not know what advice to give or they are not confident about it. I guess that that can be met only by the school and by careers advice in school, making up for the lack of advice at home that lots of kids get and some do not.

Kemi Badenoch: We need to try to level the playing field to make sure that it is not the family you come from that decides where you end up. There are things that some parents and families can do that others cannot, but the job—

Q428 **Carol Monaghan:** You describe that as probably quite a typical situation. If you go to a science museum, there are lots of science discovery kits that parents will buy for children because they want them to be interested, but if you are coming from a different, more disadvantaged background possibly that will not be available to you. How do we affect

the choices that really start at birth, whether because of your socioeconomic background or because of the prejudices of your parents? How do we drill down to that and start tackling it?

Kemi Badenoch: By making sure that people are aware of their options at every possible opportunity. Marcus talked about careers guidance. Some of it is non-existent in certain places, or, worse, you have families that have a stereotypical understanding of what would be good and what their experience of the 1960s or the 1980s was and they are giving advice that is no longer relevant in today's job market.

Schools do need to do that. We have brought in some legislation around careers guidance. "Inclusive Britain" also has some actions around making sure that people have the guidance for which courses are best, irrespective of what a league table might say. For instance, some courses are better in terms of job opportunities afterwards. One of the things we have done is to get lots of people into university, but what the study at university does not really cover is that some courses are terrible in terms of earnings, which is a really important factor for what people are choosing to study.

We have some actions around that to improve the options. Making sure that people are aware of their options at every stage and creating as many options as possible is critical.

Q429 **Carol Monaghan:** We have been told that there is a perception that STEM subjects are more difficult than others. Why does that exist? We heard evidence directly that girls were not picking physics because of the hard maths. Why do such perceptions exist? When these are being reiterated by school headteachers, how do we deal with that?

Kemi Badenoch: The perception exists because it is true. Physics is tough; it is very difficult.

Q430 **Carol Monaghan:** It was not for me; it was dead easy for me. English was tough for me.

Kemi Badenoch: There will be general aptitudes where some people are more suited to them than others. If I was to look at the number of hours that I did in my engineering course compared with someone studying English at university, it is not comparable at all given the sheer amount of time you have to spend to learn certain courses—not all of them. It would be wrong to say that all courses and all subjects are equal. That is simply not true. What we should not do is tell people that just because something is difficult they should not do it.

We should let people know that the tougher something is the more rewarding it will be if you complete it, just like climbing a mountain or running a marathon. We do not tell people that running a marathon is the same as running 100 metres and everybody can get a medal at the end of it. What you get at the end of these things is different. Certain people

will have certain aptitudes. There will be some people who find really tough things easy and really easy things difficult.

We also look at neurodiversity and people who are on the autistic spectrum who cannot cope with some things that we think are very basic, but teaching people that difficulty in and of itself should not be a barrier is absolutely essential. That was what I found when I was at school. I had been encouraged to do easy things rather than supported to do things that were more challenging.

Q431 **Carol Monaghan:** You have not tackled the comments made to us specifically about girls not doing physics because it is tough and the hard maths. Why is it different for girls than for boys? I am not asking you to justify it.

Kemi Badenoch: I do not know. Why do girls not do physics instead of mathematics? It may be that they do not know—here I am speculating—what the options are that a physics course will allow you to do. One of the reasons I went into engineering is that I wanted to understand how certain things worked. Many people say you do not need to do this; it is useless. Why are we studying something that you will never use? Understanding the use and purpose of a specific subject might have an impact.

Why do fewer girls do it than boys? It may be to do with people dropping out when they see that not many people are there.

Q432 **Carol Monaghan:** I am not asking for the reasons, because we have had so many witnesses. I am asking what the Government are going to do to tackle such perceptions that girls should not do certain things because of that.

Kemi Badenoch: I do not think anyone is saying that girls should not do certain things. We have to understand that there is a limit to how much government can do. One of the problems we have at the moment is that everybody is asking government to fix every single problem. "Can you fix this? Can you fix that?" We are doing lots of things, but it is not effective. Broadly, it is about making sure that the options are there and that caricatures and stereotypes are removed, but there is also perhaps an element of personal preference. You have to take that into account.

Is the issue of girls not studying physics in the same number as boys a game changer in terms of outcomes? Is it a game changer in terms of social mobility for that specific subject? I do not know that is the case, so it would not be where I would start in government intervention.

Q433 **Graham Stringer:** I go back to the comment Gillian Unsworth made about standardising the wording of questions in interviews, because there are generations of evidence that prejudicial questions are asked in interviews. Is not the opposite problem that if you standardise interview questions everybody learns the questions and you get textbook answers?

Kemi Badenoch: Yes. That will happen. What I tell people is that there are no solutions; there are only trade-offs. If you try one thing you will probably get an unintended consequence with people trying to game the system in another way. Therefore, doing everything and keeping all the options open is important.

Standardised questions are needed; they have a place. We all know in interviews that there is also a subjective element and that people are being judged beyond certain fixed criteria. For instance, social skills are very hard to fake. It is about making sure we do things like looking perhaps at the challenges that individuals have had to deal with to get where they are.

Those sorts of things should be factored in. The broader the criteria you use to assess them the better, but certainly a lack of standardisation does create problems where people have an affinity towards someone who is like them and they start asking easier questions, for example. We see things like that in interviews.

Q434 **Graham Stringer:** "What does your husband think about this?" might be another. That is very helpful in writing the report we will eventually produce.

When Governments are serious about issues they often set hard targets. I think net zero is a hard target. Do you think we should set hard targets for the participation of girls from ethnic minorities and particular subjects at school or in parts of the employment structure?

Kemi Badenoch: No. I do not think that will work. You then have to get very specific. The easiest way to do it—I am not suggesting we do this—is to make it mandatory and say that everybody has to do these subjects. The problem would then disappear, but people who did not want to do something would get put off, and so on. There is no easy solution.

The problem with a target is identifying the exact problem you are trying to fix. Is it the number of people who are seeking a specific subject, or is it the number of people working in a particular industry and the pipeline is affecting it? Are people dropping out? I would be classified as somebody who dropped out of engineering. The reason is that I went into banking, which paid better and they wanted people who had maths skills. If you put a target on that you would not be able to fix that problem. I am very suspicious of certain types of targets in this space where there is a lot of individual choice influencing the decision.

Q435 **Graham Stringer:** What did the Government learn from the Commission on Race and Ethnic Disparities that they did not already know?

Kemi Badenoch: Lots of stuff. There were some things we did know. We knew a lot about the negative disparities and the specifics around participation in workforce, pay, etc.

As to the things we did not know, disaggregation within groups was really important. For instance, we had evidence related to the huge disparity in the number of black boys being excluded from school, but when we looked at the figures it was black Caribbean boys who were being excluded; black African boys were less likely to be excluded than white children. Therefore, knowing there were significant differences between community groups that were lumped together, even under black or Asian, was particularly important.

There were things around cultural impact. For instance, we saw Bangladeshi girls doing very well at school and then disappearing. Those were cultural impacts: early marriage, a patriarchal society and disappearing from the workforce, even though they had achieved the grades.

Looking broadly at geographic disparities, we learned loads of things. There was one statistic around Bangladeshi boys doing badly overall, but Bangladeshi boys in London did very well and in places like Bradford they did badly. The problem was not Bangladeshi boys; it was Bradford. Focusing on the area, not just ethnicity, is very important.

There are positive disparities. There has been a narrative that everything is terrible in every way for all ethnic minorities. We found some health disparities along the lines of life expectancy and so on. There was something around lifestyle and how that influences people's overall health. We learned lessons from that.

Q436 **Graham Stringer:** Pursuing the recommendations of the report will require the co-ordination of a number of Departments. How will you do that?

Kemi Badenoch: It will be very difficult because Departments like doing their own thing and getting everyone even just to agree to the set of recommendations is quite tricky.

How will I do that? First, it is about taking the initiative and responsibility within the Equality Hub, which is based in the Cabinet Office. It does have that convening power to compel Departments at some level, but it is also about setting myself the target of giving a report in a year's time on how far we have gone. That kind of target—we need to explain what we have done next year and the year after—means that people are forced to keep working on their actions.

I have meetings every day with people who are supposed to be delivering many of the actions, not all of them in government. For instance, yesterday I spoke to the Association of Police and Crime Commissioners on equality and diversity. I have spoken to two of their leads on that, so it is about making sure that the stakeholder engagement is frequent and people know that the Government are very serious about this and that we have our ministerial "bilats", for example, and inter-ministerial groups

where we have specific issues to resolve. We are reporting to Parliament in a year's time to show the progress that has been made.

All those things will help to corral everyone into making sure we are moving at pace on these things.

Q437 **Graham Stringer:** Getting the boss, the Prime Minister, involved in this is important. Do you have regular meetings with him about it?

Kemi Badenoch: I do not have regular meetings with the Prime Minister, but my senior Minister—the Foreign Secretary—and the Secretary of State for Levelling-Up do, and they are both very invested in this.

Q438 **Rebecca Long Bailey:** There are examples of positive action to break down barriers to progression, such as incentives to put forward more candidates from certain groups, or mandatory pay gap reporting. Do you think such approaches should be mandated across academia and industry? Do you think that progress on that should be monitored by an external auditing body?

Kemi Badenoch: Overall, no, and I will explain why. On positive action, encouraging more people to carry it out is critical. We found that a lot of people do not understand the difference between positive action and positive discrimination, which is illegal. We find that many people do not know how to do the things that are already law; they do not know how to carry it out, so helping to clarify what you can do now rather than bringing in more new things is my preference. On even things like the public sector equality duty, I have had to write and explain how to do it. There is a lot of illiteracy around how to carry out these tasks, which is really critical.

On ethnicity pay gap reporting in particular, we will not be making it mandatory. What we are going to do is support people to do voluntary reporting because, unlike gender pay gap reporting, which is binary—you are looking at only two different categories, which are represented equally across the country—ethnicity is not equally represented across the country.

You also have many different groups. Which categories are you going to be looking at? Are you going to be judging it on a national scale, or just what is right for a local area? Sector participation can be affected by somebody's religion, somebody's beliefs, and so on, but it is very hard to do mandatory peer reporting for something that is not simple and binary like gender.

That is why we do not think it should be mandatory, but we will support those people who want to do it and continue to evaluate it because we have not proved that it is working for gender pay gap reporting. We think that there is some evidence, but there might also be correlations or causations, so learning the lessons from what we are doing and providing the clarity is far more important than bringing in a new thing.

Q439 **Rebecca Long Bailey:** It has been really lovely to hear your story today. I did not know any of that before today, so thank you for that.

I spoke to your colleague earlier about comments made recently by the chair of the Social Mobility Commission. She said that working-class and disadvantaged people should take smaller steps before aiming for Oxbridge. Would you agree with that sentiment? If not, why?

Kemi Badenoch: I certainly agree with her that we are obsessed with Oxbridge in this country in a way that is not normal. I do not think any other country has this view of counting how many people have gone to these particular universities. I did not go to Oxbridge. Certainly, within STEM they are not necessarily the universities you would go to rather than Imperial College or Edinburgh for AI. I think we should be building up more of our great universities rather than just talking about those two.

As for what she said about small steps, my understanding of the comment is that she was explaining that social mobility is not always a rags-to-riches story; it cannot always be the immigrant who came with nothing becoming the Prime Minister or going to Oxbridge, but it is someone who just goes to university, becomes a teacher and demonstrates great social mobility if they came from a very poor or disadvantaged background.

We also need to take pride in many of the jobs that are not the top execs or CEOs of the FTSE 100 companies. There is a lot that people can be proud of within that. Always trying to aim right for the top instead of other things in the middle can stop social mobility.

Q440 **Rebecca Long Bailey:** I appreciate the comments you have made, but I am sure you will understand that the comments made by the chair of the Social Mobility Commission send out a certain message. Your parents sounds a little similar to mine. I wonder what they would have said if you had come home from school and said, "Daddy, I should not apply for Oxford or Cambridge; I should aim my sights a little bit lower for now and stop obsessing about it." What would they have said in response?

Kemi Badenoch: I think that is a different question. Everyone should certainly aim for the highest and the best, but how we define those things remains to be seen. I was told not to apply to Oxford or Cambridge when I was doing my A-levels because "They do not take people like you." I am more worried about things like that than about more positives.

Q441 **Chair:** Who told you that?

Kemi Badenoch: The headteacher at my FE college. I went to an FE college and I was doing A-levels part time. I came from a middle-class family and became working class, coming to the UK with nothing. That was how they viewed me. They said, "Why do you want to go to this place?" They also had their own personal experience that they projected on to people. That is what I mean by the closing down of options.

To go back to Katharine Birbalsingh's comment, she is not a politician; she is someone who says things exactly as she says them. Our job in government is to make sure that people understand we are doing everything we can to ensure that all the ladders and levers are there for wherever people want to end up. If that is Oxbridge, great; if it is not, then it is making sure that they are not doing anything that damages their work or life chances or those of their children.

Q442 **Rebecca Long Bailey:** It is interesting to hear of your experiences at A-level and what you were told. That has been the experience of so many children across Salford. It was also my experience because of my background.

To redress that, do you think that schools should be awarded a certain number of places at Russell Group universities to ensure we are not putting barriers in place for children who are from working-class and disadvantaged areas?

Kemi Badenoch: I do not know about a certain number of places. I do know that for certain groups of disadvantaged children a university close to home is a much bigger influence on where they go rather than them going to Russell Group universities. If a Russell Group university is very far away from where they live it will not attract them, so mandating that schools send them to these places is not necessarily the best thing. Making sure that universities are better and are awarding great degrees and that we have more Russell Groups rather than sending specific numbers to them is very important.

Q443 **Chair:** To go back to what you were saying about the difficulty of subjects, you gave a very compelling—indeed, inspiring—message: "Do not let difficulty put you off; you should aim for it." Nevertheless, when we have exams—for example, A-levels—the results are supposed to be comparable, so grade A in English is supposed to be the same as a grade A in maths. Do you think that has not been calibrated correctly? Do you think we should be giving more grade As in maths or fewer in humanities subjects, to characterise it like that—to try to aim for an A-level being an A-level?

Kemi Badenoch: I do not know. We are stepping well outside my area of expertise now. I do not want to say anything that will upset DFE Ministers. I have never thought about that before, so I would not want to speculate.

We risk tinkering too much with the system and making things too complicated for people to understand. There will always be subjectivity in how people perceive an A in physics versus an A in drama or something else. That will probably compensate enough, if one thinks about it now, than doing anything more significant, but I would not claim to be an expert on that.

Q444 **Chair:** One way or another you have been clear in your evidence that at various points there is the risk, to put it most strongly, that people get

given advice that puts them off what might be a course that leads to a very successful STEM career, whether that is your parents, through schools or a mistaken assessment of people's abilities. One way of countering that is to keep people's options open for longer so they are more resistant to them. There are different ways in which that can happen that the Committee has considered. One is for people to continue to study maths beyond the age of 16. There is something called core maths, for example, that is not examined as an A-level but takes you beyond 16. That then keeps options open later on. Do you think that may be a solution, whether requiring or, even less, encouraging or expecting people to do something like that? Would that help to keep options open against these interventions?

Kemi Badenoch: I am the wrong person to ask because I am biased. I did maths until 21, even 22. Therefore, having people do maths beyond 16 from my perspective is a no-brainer because that was what I did. Therefore, I am biased in that respect.

I think there is a general numeracy issue across the board. I see it in things I read in the paper where I can tell, just being able to compare stats, that there is a general issue of numeracy across the board in the country. If it was up to me I would make every journalist, civil servant and MP do a maths test before they can take on those jobs, so, if core maths is the answer to that, perhaps.

Q445 **Chair:** Your experience is as someone who has done it. You must have lots of friends who could have done maths but stopped it at 15 in effect.

Kemi Badenoch: Absolutely.

Q446 **Chair:** On the breadth of the curriculum post 16, many people expect to do, say, three A-levels, so they have to make a choice at the age of 15 or 16 to narrow things down. Do you think it would be desirable to have a broader set of exams more like the international baccalaureate? The front page of *The Times* today has the results of an education commission which says that you should study six subjects between 16 and 18, three in detail but at least one STEM and one humanities subject. Do you think that would help to keep options open that might be closed down?

Kemi Badenoch: It might do. I have not seen the basis of the recommendation it is making, so I would be very wary about endorsing it. Certainly, it is about keeping options open as much as possible. I think that was what AS-levels tried to do, with people doing as many as possible and then specialising in the second year.

What happened with those proposals? Some of these things keep coming round again and again in different formats. What does the evidence say? I do not think we should just focus on A-levels as the route to broadening and providing options. It could be changing the way we look at degrees and having a more American system where when people progress beyond that they do majors and minors; they do not do just engineering but have a humanities course.

Looking at a lot of the technical education that we provide, is it sufficiently specialised? Is it excellent? There are many ways to skin a cat.

On the baccalaureate system, I do not know enough to be able to give a view, but we should certainly consider it. I am sure that the DFE will provide a response to that commission.

Chair: Minister, I thank you very much indeed on behalf of the Committee for a fascinating session, in particular your willingness to be drawn on your own personal experience, which brought to light some of the issues at hand. I also thank your officials who accompany you.

Examination of witnesses

Witnesses: Professor Dame Ottoline Leyser and George Freeman MP.

Q447 **Chair:** On our final panel of witnesses is George Freeman, Minister for Science, Research and Innovation. Mr Freeman is a frequent visitor to the Committee; it is good to have you back, Minister. Joining us remotely is Professor Dame Ottoline Leyser, chief executive of UK Research and Innovation. Thank you both very much indeed for joining us.

Minister, you are aware of the inquiry that the Committee has been conducting; we have taken a lot of evidence from a lot of people. One of the themes is that the participation in science, technology, engineering and maths by people from more deprived backgrounds and more disadvantaged backgrounds, people of certain ethnic minority backgrounds and women and girls is not what it could be and has persisted at a low level for many years. Do you recognise that picture, and do you have any thoughts about how you can have more than an incremental change in that?

George Freeman: Thank you, Chair. Yes, I absolutely recognise that picture and the urgency of it, and I am really grateful to you and the Committee for this opportunity and for the work you have been doing on it.

We will get into some of the detail, but on your question about how serious and how urgent this is, I want to make one or two points. I absolutely think this is urgent for several reasons.

First, it is an article of faith for me—I say this as a former co-chair of the all-party parliamentary group on inclusive growth and having had a career in STI—that we will never build a true opportunity society unless we embrace an innovation economy, and we will never build a serious innovation economy unless we have an opportunity society. I think that the two drive each other. It is very difficult to drive a more open and opportunity society if your economy is old-fashioned, vertical and siloed.

Equally, as we grow the innovation economy, we should see much higher rates of opportunity. That is a really important point of principle, which makes the situation at the moment all the more urgent and all the more intolerable.

I will say something about the urgency and some of the key statistics we need to be focused on. I also want to highlight that this is good business. All the best and fastest-growing businesses I have the privilege of meeting and talking to say to me that having an open, diverse, bright, engaging, ambitious and opportunity-based approach to inclusive growth and employment is good for business, and most of the innovative companies want fresh thinking. I do not think this is an either/or, and all the voices from businesses I hear are that they share that.

Secondly, on the all-important data, I want to flag that we have made some improvements. There are some positive steps. I particularly highlight the STEM Ambassador programme. It has got to scale so that 72% of all state secondary schools and 33% of primary schools are involved in the STEM Ambassador programme. Forty-five per cent. of STEM ambassadors are women, with 15% from minority ethnic backgrounds. That is not enough, but it is a lot better than we have had in the past, and 250,000 hours last year in primary schools. The research data suggest it is getting better.

The figures we should focus on are that only 25% of the UK STEM workforce was female in 2021. That seems to me extraordinary. We are not talking heavy industry; we are talking jobs that are absolutely suited to women in every way. In fact, at the top of the pharmaceutical industry and others, there are very high rates of female leadership, so that seems very strange.

Secondly, on the black and minority ethnic percentages, STEM has a lower share of black workers—2% versus 3% in the wider economy—but even more shockingly a much lower percentage of Bangladeshi and Pakistani workers, which is very strange given their very strong instinct towards science and entrepreneurship in all sorts of sectors and in technology.

Thirdly, I would highlight the management and professional aspect. The latest data show—and the data is sparse, which I know we will touch on; it needs to be better—that 70% of those from advantaged backgrounds obtain a managerial or professional position by ages 30 to 39. That is compared to 60% of those from intermediate backgrounds and only 48% of those from disadvantaged backgrounds. We need to make sure that we also promote and support those people from communities that have not had sufficient exposure.

Q448 **Chair:** Thank you, Minister. It is clear you are seized of the problem. We are a little short of time, so we are going to need to have some brisk answers. Let me ask a question to Dame Ottoline before I turn to my colleagues.

Dame Ottoline, thank you very much indeed for joining us. It is very good of you to give evidence today. You are at the top of the tree of UK science. You head not just Britain's but one of the world's biggest science funding agencies, and you are a very distinguished and successful academic in your own right as a former director of the Sainsbury Laboratory at the University of Cambridge.

Your damehood was awarded partly for your excellence in research but also partly for your services to equality and diversity in science. You have surveyed the scene and you are aware that you are comparatively unusual. You are not unique; we have very many very successful women scientists in particular. Tell the Committee why you think that the people who achieve your level of eminence are still rarer than men.

Professor Dame Ottoline Leyser: Thank you. I was hoping to be there in person, but, unfortunately, I have covid. If I succumb to coughing, that is why, and I apologise. I will do my best.

Chair: We appreciate your giving evidence notwithstanding the otherwise very good excuse that you would have had.

Professor Dame Ottoline Leyser: It is an extremely important inquiry to me both personally and professionally. This is a critical issue, as the Minister has highlighted, for a variety of reasons. Critical among those reasons is that research and innovation thrives on difference. It is all about disagreement, fundamentally. It is about what happens when multiple people disagree, and what needs to happen is those people need to engage with one another and understand why they are disagreeing, and through that is where a lot of new ideas and an understanding emerges.

How does that relate to my experience? I have been fortunate in my life. I grew up in an academic family. They were all historians, I have to say, not STEM people, but that culture of debate and discussion was something I very much grew up with and feel very comfortable with, whereas much more broadly in our culture it is not as valued and supported such that people are much more interested in fitting in than they are in having an interesting conversation with someone with whom they disagree.

It is quite fundamental that cultural issues like that about what is valued and rewarded in all kinds of contexts create some of these barriers that are so important for us to take down.

"Not for people like you" is a very interesting comment, which we have heard already in this inquiry. What does that mean in the context of research and innovation where precisely what we need is different kinds of people? How can it be "not for people like you"? That is a contradiction in terms that we need to find ways to undermine and overturn.

That is difficult because that is a quite profound culture change and will require multiple aligned interventions to achieve. You cannot solve it with

just top-down targets and you cannot solve it with just bottom-up hope. You have to combine a whole variety of things to shift things over into a more engaged discussion area.

Chair: Thank you for that. We will go into some of those specifics now, starting with Tracey Crouch.

Q449 **Tracey Crouch:** Thank you very much, Chair. I am new to this Committee, and this is my first session on this subject. It is also the last session of the inquiry. It is clear—and you reiterated it, Minister, in your introduction—that there has been a presentation of quite shocking data that shows widespread under-representation in STEM research.

It feels a little bit unkind to ask the white, male Minister why this is so. Instead, may I ask you if you could give us an update on the BEIS R&I workforce survey and how you think it will help to improve the current picture that we have all heard about and you mentioned in your introduction?

George Freeman: Thank you. You put your finger on the key to this, which is data, in my view. If we can really start to publish and show data by sector, place and institution—good data that is accurate and reliable—we will start to change the culture. You and I, Ms Crouch, both know that, as Ministers or leaders in any form, when you are accountable and your data is published you really take it very seriously. That survey is a really important piece of work and we are looking to publish it as early as we can in the autumn because it will show a significant commitment to transparency.

Q450 **Tracey Crouch:** When you publish that data, will it have an action plan aligned with it, and will it give some timeframe for how we can change the sheer under-representation in STEM?

George Freeman: The R&D people and culture strategy has a whole series of ambitions and workstreams connected to it. I think they are all admirable, but my instinct is that simply publishing admirable ambitions does not go far enough.

I hope to do two things in the autumn. One is that the data will shine a light on where the most urgent problems are, and I want to make sure that from that transparency flow some specific and tangible actions. I also want to use that as a moment where we publish an update on the R&D people and culture strategy so that we are monitoring what progress we are making on some of the tangible outcomes. It is very easy in this sector to make aspirational statements, but this sector needs a stronger, dare I say it, scientific and data-led approach.

Q451 **Tracey Crouch:** Thank you. Dame Ottoline, we have heard that women and people with disabilities and people from ethnic minority backgrounds are less likely to apply for research funding, they are less likely to receive the funding when they do, and more likely to receive smaller amounts than their white, male counterparts. Why is this? Is there anything in

particular that you are doing to address it?

Professor Dame Ottoline Leyser: That is a huge question. It is not quite accurate and it depends. In the context of gender, where there has been the most work over the years and we have the best data overall, it is, in our data, the case that there are indeed fewer women applying for funding than one might expect. There is, with the exception of one of our research councils, no evidence that they are less likely to receive funding. We have equal success rates in virtually all the research councils. They are indeed likely to apply for fewer large awards, which is very skewed by the fact that the really big grants—for example, large doctoral training accounts that are running a big cohort of PhD student training activities—are typically disproportionately run by men.

It illustrates, and is the case across all those characteristics, that the underpinning reasons that are associated with the data, many of which are indeed incredibly shocking and upsetting, are complicated. They differ in different subjects. They differ in a variety of things. It takes quite a lot of time to dig down and understand exactly what is going on, and therefore put in place sensible action plans to address them. That is exactly what we are doing across the board in UKRI.

All the councils have their individual data. They have the aggregated, collective data. We have four of us sharing good practice across the whole organisation and systems where, if it is clear that a harmonised pan-UKRI approach is going to be more effective and useful for the community, those things can be put in place.

As the Minister said, having the data is an absolutely essential first step, which has not been easy for us because we are still at a phase of our data systems being incredibly out of date and needing upgrading, but very well worth the investment of creating that really high-quality data bank. We are improving that year on year, and then from that doing the careful analysis to understand what is going on, which is quite often not at all intuitive, and therefore putting in place very targeted and specific interventions to address what is going on specifically in each discipline and area of our work.

Tracey Crouch: Thank you.

Q452 **Aaron Bell:** May I follow up on that, Dame Ottoline? You mentioned that you have done the most work on gender. I am sure you saw what Professor Narender Ramnani said to us about his inquiry into the ethnic composition of research council committees and how few people there were who identified as ethnic minority, with a particularly low inclusion among black participants. In fact, in one research council, there were no committee attendees who disclosed their ethnicity as black over the whole five-year period. How has UKRI responded to and changed as a result of Professor Ramnani's findings?

Professor Dame Ottoline Leyser: As I mentioned, we are year on year improving and expanding the data that we are collecting and publishing. Open publication of those data is crucial. As you may have seen from our draft EDI strategy, on which we are currently consulting, including those peer-reviewed data in that overarching dataset is one of the things we are proposing to do so that that is absolutely out there and transparent. Every council is putting in place an action plan to address the issues that have been identified across the EDI spectrum, and those are council-specific plans because, as I have already highlighted, the issues are very different in different councils, and they need specific plans to address them.

Q453 **Aaron Bell:** The guidance is clearly coming from you at the top to all the research councils that that is what UKRI wants.

Professor Dame Ottoline Leyser: UKRI is the research council.

Q454 **Aaron Bell:** Yes, exactly, but it is you making it clear that this is a priority for all the councils to deliver on this.

Professor Dame Ottoline Leyser: Absolutely. The key decision-making body on a lot of this activity in UKRI is the executive committee, which consists of me and the chairs of the nine councils and a few other key senior leaders, including our chief people officer. It is a collective endeavour, and we are absolutely committed across the organisation. This is a key agenda for us precisely because the excellence in research and innovation will simply not happen until we have that truly diverse system where all the talents and skills needed to deliver excellence are properly recognised and rewarded, and therefore the full diversity of inputs is properly recognised and awarded.

Q455 **Aaron Bell:** Thank you. On bias in grant application processes—and we have heard a bit about that—you have championed narrative CVs. Are they making a difference? Secondly, should academic research records be evaluated on a pro rata basis so as not to disadvantage those who have taken career breaks?

Professor Dame Ottoline Leyser: The narrative CV initiative has been brought in precisely to counter the serious problems we have quite accidentally almost built into the system of how we assess researchers and innovators currently. We have fundamentally dumbed down the definition of excellence in a desperate attempt to be fair and objective so that we are now massively over-rewarding particular types of research output and particular types of research input and contribution, and we are massively under-rewarding the full range of activities that we know are essential for a truly excellent research and innovation system.

There is a shift from a classic CV, which typically consists of lists of things like the papers you have published, the grant awards you have already won and the prizes you have been awarded, to a CV that provides you the opportunity to provide clear, robust evidence using a whole variety of evidence types that you have contributed excellence in the context of

knowledge generation, in the context of the people whom you have supported, the wider contributions you have made to the research and innovation system, and your engagement with the key stakeholders for the research and innovation system across society.

All researchers need to do something in all four of those categories for an excellent research and innovation system, which is what we are critically interested in. They do not all need to do everything and they do not all need to do the same thing, but they all need to do something. This new CV format provides the opportunity to set forth in a highly evidenced way excellent contributions in those four areas.

That is critical precisely to address the second part of your question, which is how we deal with the variety in careers that people have. That includes people who have taken career breaks for one reason or another, but critically also needs to include people who have taken unusual paths into and out of the core research and innovation conducting organisations.

There is an awful lot of talk here about pipelines. In the academic career in particular there is a notion that there really is only one academic career, which is essentially that you go to university and you never leave. That is incredibly damaging precisely to the diversity in the system that we need. We need people to be able to move into and out of the academic research base across the other sectors. That narrative CV is aimed at addressing all of those.

Aaron Bell: That is extremely helpful.

Professor Dame Ottoline Leyser: You do not have to—*[Inaudible]*—monitoring.

Q456 **Aaron Bell:** Have you anecdotally seen evidence that this is having the desired effect already?

Professor Dame Ottoline Leyser: It is too early, but we are running it out in pilots. We are monitoring it. It will take really high-quality training both in helping people to prepare a CV of that sort and in the context of assessing how you use it. It is certainly popular, and we are engaged internationally in a whole variety of initiatives to get this approach rolled out across the whole system globally.

Aaron Bell: Thank you. I am sure the Committee will keep an eye on it.

Q457 **Dehenna Davison:** I want to continue on this. One of the biggest causes of anxiety for researchers across the board, but particularly in STEM, is around short-term contracts and the precarious nature of their work. We have heard evidence that that is particularly disadvantageous to those with disabilities who need adaptations in their home, to those with families and to those from lower socioeconomic backgrounds who perhaps do not have the means to keep moving around the country to chase the funding. What is being done in the Government to try to

address this?

George Freeman: Thank you. It is a brilliant question. I defer to Ottoline on the specifics within UKRI. You make a really important point about the short-term nature of contracts, and it links, Chair, to the previous point. One of the things we need to do is make sure that in our research ecosystem we are not overly dependent on the old model of people joining a research laboratory and becoming a guinea pig on the wheel of constantly submitting short-term grant applications. There is a place for that as you are starting your career.

A lot of researchers I speak to say that we need to start matching some of the programmes the Americans are running and some of the fellowship programmes that the Wellcome Trust has set up. Yesterday, I was with a brilliant young British woman who has left Oxford and is in her late 20s. I will not embarrass her by mentioning her name. She has won a very prestigious Max Planck fellowship. That means that for 10 years she has funding for a postdoc, a researcher and a technician, and can choose which Max Planck institute she goes to, so she is empowered. It breaks her from the cycle of having to work for a senior professor, who is most often likely to be of yesterday's style.

That funding model change is what I am pushing hard for through our UK research ecosystem. If we had to do Horizon plan B, which we may come on to, I am really keen that we make sure we use these opportunities to drive slightly different models of research, which will help to drive EDI. I defer to Ottoline on the specific things she is doing, particularly on disabilities.

Professor Dame Ottoline Leyser: This is another complex picture. That precarity stage in contract length is typically about postdoctoral researchers who are not driving research programmes; they are working on research programmes, but the holder of the grant is somebody else. It is part of a wider set of issues that have driven very high pressure into the research and innovation system, and those pressures feed off each other in a cycle that creates the hugely negative impacts of short-term contracts. The negative impacts are not fundamentally, in my opinion, about the length of the contract; they are about the anxiety about what you might be able to do next.

There are a couple of different elements to fixing that problem, one of which is in the context of this career path diversity that I have already talked about. If a much wider range of people think about their time in an academic research lab as a staging post to an extraordinary variety of other things and there is also the opportunity to come back into that later, that goes a long way to reducing the anxiety around precarity because it is clear that there is an extraordinary range of options available. That is not to say that we do not also need to think about the structures of our funding systems so that they support the full range of activity that we need, and that includes the kind of long-term fellowships and things that the Minister discussed.

The key to a high-quality funding system is diversity in funding types because there are different cycles in the stage of projects and ideas where a short pulse of pump priming is what you need versus that longer-term time horizon. Keeping dynamism in the system and a turnover of projects and the opportunity for multiple people across the system to apply for funding to drive forward their current exciting idea is critical, so locking funding entirely into big, long-term pots of money is also a bad idea.

All of this stuff is about balance. It is about diversity in its broadest sense and managing a portfolio that captures the best balance of things to support diversity of all types in the system.

Q458 **Dehenna Davison:** Thank you. Minister, back to you on this. We know that the covid pandemic, for all the horrendous negatives, provided some opportunities for remote working and other more flexible working, which for particular groups, like those with disabilities or caring responsibilities, have been hugely advantageous. What are the Government doing to try to retain some of those benefits, particularly for some of these under-represented groups?

George Freeman: You are right. On the specific issue of disability access and engagement, you are right that the pandemic equalised in many ways, and it removed the geographical barrier and friction. Equally, it would be a huge mistake if we concluded that people who struggled to travel and access can now work from home. Actually, that interaction of people in buildings is absolutely key, I would argue, to science and research perhaps even more than, but equally, in government. People need to be able to meet to talk and read the body language, and doing it all through Zoom is problematic. You made a really important point about harnessing the benefits of remote working, but it would be a disaster if we concluded that we now do not need to get people into labs.

On your point about those short-term contracts, Dame Ottoline is absolutely right that there is a mix. The way I am approaching the ecosystem is that if we are going to continue to be a global powerhouse in science, research and innovation in a world where we are moving to £22 billion a year, which is brilliant, but China is at £240 billion, America £180 billion ex-defence, and Germany at £60 billion or £70 billion, we need to make sure that our £22 billion is the best £22 billion in the world, and that is going to be all about people and making sure that we have a really attractive offer for especially the new young-career scientists.

For them, the short-termism of joining a professor's lab and spinning on the wheel of short-term contracts is a big challenge at a time when you are starting off in life, perhaps have a partner, and are thinking about starting a home and a family. If we offer, as I am planning to, seven or eight-year fellowships globally, we have a really good chance of attracting people here, and they will stay here; they will fall in love with something, somewhere or someone. We also have a chance of backing the insurgent,

young, free-thinking scientists of tomorrow in our own system. It is a win-win.

Q459 **Chair:** Before I turn to Graham Stringer, I have a question to Dame Ottoline on precarious contracts. Is this down to universities, in a way, that offer these short-term contracts? Most businesses do not have multi-year contracts—10 or 20-year contracts—with their customers. They compete all the time to get business, but they employ people on permanent contracts, confident in the expectation that they will continue to be able to attract business.

Universities are some of the most stable institutions in the country. They have research funding that comes from QR, quality-related research, that is, barring wholly unforeseen circumstances, predictable. Should they not take responsibility for their workforce and employ researchers on long-term contracts even though they may move from one research project to another rather than throwing this risk on to the workforce?

Professor Dame Ottoline Leyser: That is a really interesting question that has been explored quite a lot over the years. Some universities have that kind of system where researchers have open, long-term contracts but then are required to move between projects depending on which projects are funded. If you are in a university with a sufficiently wide research base in a particular area, there is a likelihood that there will be some research in that area that is relevant to the expertise and skills of a particular researcher.

I agree with you that one of the things that universities can do with the block grant funding they receive in QR is to use that to mitigate some of the instability in the contracts of postdoctoral research staff. Obviously, all postdoctoral research staff cannot do all projects that a university is funding because there is a huge breadth of the type of work and the subject area. The total pool of postdoctoral researchers in a university is not equivalent. That is one issue.

The second really important issue that I cannot emphasise enough is that there are extraordinarily important reasons why we need to keep the churn in the workforce across the whole research and innovation system. Part of the problem is that our research system in academia is very focused on the research system in academia. Early-career researchers are given the impression that the only worthwhile career is replacing their professor when they retire. That is simply not the case.

There should be support for that extraordinary talent in the early-career research system to realise their talents and ambition in the much wider research and innovation system. Remember, most research and innovation happens outside the university sector. Supporting people to understand their opportunities is a critical role that universities need to play, and it is another use of QR—providing those wider horizons for the researchers whom they employ.

Chair: Thank you very much indeed. Our final questions are from Graham Stringer.

Q460 **Graham Stringer:** Dame Ottoline, UKRI was partly set up to take an overall look at the landscape of research funding. It gives you the opportunity to change that landscape and to refocus where research takes place. How have you done this, and who will be the winners and losers in the refocusing of that? In awarding grants in this new regime, how is that going to help diversity?

Professor Dame Ottoline Leyser: Thank you. One of the extraordinary opportunities that have arisen as a result of the creation of UKRI is the opportunity to look at the entire landscape under one umbrella. We cover all the disciplines and all the sectors. We support people through PhD studentships and fellowships. We support infrastructures and we support innovation through a variety of Innovate UK and wider programmes. There are those grant funding opportunities that have been, I know, talked about quite a lot on this Committee. It is a huge portfolio.

I should point out that that grant funding—those fully open response mode applications that have been the focus of a lot of the discussion and the statistics—is 12% of our budget, and there is another 7% that is a targeted response mode in particular areas. Overall, that is quite a small part of our budget. The QR funding that was just discussed is 21% of our budget. More money goes into universities to QR than goes in through those particular sorts of grant funding, and then about 10% on studentships and fellowships, and about 11% on institutes. It is a big portfolio.

You can slice it in a whole variety of ways. You can ask about balance between disciplines. You can ask about balance between universities and institutes. You can ask about balance between infrastructure and people. You can ask about balance between targeted response mode and open response mode. All those questions are questions that we ask. It has been our executive committee with all the executive chairs sitting around the table who have discussed how we can make the best use of the very large amount of taxpayers' money that we have been given to fuel the future, innovation-led economy of the UK, which is really, frankly, the only way we can rebuild the prosperity and opportunity for everybody right across the UK. That is our mission, and it is building that properly balanced portfolio that is key.

"Winners and losers" is not an appropriate way to think about it. We have to invest that portfolio in a way that grows the portfolio over the years, attracting masses of private sector investment. That private sector amplifier is critical. It is not about how big my slice of the pie is; it is about how we can work collectively to grow the pie, which absolutely means skills, infrastructures, new ideas, and global collaboration all coming together and driving the synergies that we need to attract the private sector investment to fuel our economy. That is not a fudge. That

is not a ducked answer to the question. That is the reality of how we have to think about it.

Q461 **Graham Stringer:** I think it is a fudge, actually. I have met many researchers in my time. If they are not going to get the same grant, they will be upset. If you are saying there are no losers, that is fine, but I suspect if you are doing your job properly there will be winners and losers. With respect, I think it is a bit of a political answer.

The other part of the question was: how will the way you are allocating funds help diversity?

Professor Dame Ottoline Leyser: Of course, there will be people losing grants. In fact, one of the main things we do is reject people's grants. Our overall success rate is around 25%. Three quarters of the people who apply for funding to us will not get the funding. That is not what I mean by losers. I mean that our responsibility is to the system, and that is also true of the people who are accepting taxpayers' money to do the research, in my view.

How will that help diversity? Precisely because we are thinking about this as a portfolio of investment with diversity in all its forms as an absolutely core principle, that is how you wind up supporting the full range of activity of people and so on that we need.

Part of our problem over the years is that, as I said, in an attempt to support EDI we have spectacularly dumbed down our assessment of excellence to be on a far too narrow range of things trying to force everybody through the same very narrow doorway rather than trying to think about what we need for the system as a whole and how we can support that difference and value that difference in contributing to the overall system.

Q462 **Graham Stringer:** Thank you. I have two final questions. I will do them together because we are out of time. First, have you decided, Minister, on how the £300 million that has been devoted to mathematical sciences is being allocated? Has it been allocated?

Secondly, are we going to move on to plan B on the Horizon programme? I understand the arguments in favour of Horizon and against it, but the uncertainty is causing damage to the research community.

George Freeman: Thank you, Mr Stringer. The £300 million maths programme is key, and maths is fundamental to this whole ecosystem. I will leave Dame Ottoline to comment on the detailed allocations within UKRI, which includes Innovate UK as well. It is completely key if we are going to build this science and innovation economy.

I will come to Horizon, if I may, but can I just touch on your point? It is a very important previous question about how this new funding landscape drives EDI. We have just allocated to UKRI £25 billion-odd over the next three years.

UKRI, as Dame Ottoline has said, is changing the way we allocate funding in order to tackle what has become an overly bureaucratic, slow, complex funding system, and that is why we have put in place three reviews: the Grant review of UKRI, the Tickell review of research bureaucracy, and the Paul Nurse review of our institute landscape. We absolutely accept—and it is a passion of mine—that if we do not break this short-termism culture we will end up simply pouring people into propping up the same old professorial laboratories, not empowering the science and innovators of tomorrow. The key to this is that if we do not tackle it we will not retain excellence here in the UK; we will lose our best people to those institutions around the world that are creating big fellowships and longer-term funding. It is also key to EDI.

The most important thing that most people from non-scientific and technological backgrounds want is a job. There is a hidden middle-class subsidy for science because the job insecurity in that early stage is something that most people from low-income families and from the backgrounds that we are trying to reach just cannot afford, so those longer-term, early-career fellowships are completely key.

I want to make two final points on this. In the end, the way to achieve EDI is to embed it, in my view, into both science and innovation through incentives, not through a top-down bureaucratic compliance process that is politicised. We need to let the data reveal what is going on and then incentivise that. The key to the innovation economy is skills. What concerns me is that when I go around the 30 clusters around the country there is not enough work going on yet on how the local economy job requirements over the next five to 10 years are being mapped and fed into FE and HE, and that is a tangible way we can support EDI in the local economy.

On Horizon—

Q463 **Chair:** Before you go on to Horizon, Dame Ottoline, would you answer Graham's question that the Minister has passed on to you on the £300 million for mathematical sciences? Has that been allocated yet?

Professor Dame Ottoline Leyser: We did not receive £300 million specifically labelled "mathematical sciences", despite the announcement. Our attempt to support the mathematical sciences, which are indeed essential, right across a huge range of overall research and innovation activity depends on exactly that juggle that I just described of how you balance funding across the whole research and innovation system. There is £124 million already allocated very specifically to mathematical sciences. That is about 45% in people, studentships and fellowships, about 27% in grants and 28% to mathematical institutes. We are unable to justify the rest of the £300 million in the really dedicated ringfenced pot that was originally conceived.

I have discussed this with leaders in the mathematical science community. They are obviously disappointed and feel themselves losers,

as you described, from that point of view. What we are really hoping to do then is think very hard about how we can support the mathematical science community in the much wider portfolio of activities—for example, our new cross-cutting funds to address key priorities such as net zero where we see mathematics as important or interdisciplinarity and our pooled talent budget where maths is absolutely critical right across the disciplines.

I guess that is the answer to the question. It is not easy to identify the full £300 million pot that was announced, but we are absolutely committed to supporting the mathematical sciences both as a core discipline and in its incredibly important role right across research and innovation in driving forward all kinds of key priorities.

Chair: Graham, do you want to come back on that?

Graham Stringer: No, I think that is a very interesting answer—unless the Minister wants to come back on it.

Q464 **Chair:** It is concerning, is it not, Minister, that the Government and UKRI jointly announced a big commitment to mathematical sciences saying there is going to be £300 million additional funding, and then we discover that there is not going to be? Have you made a statement to the House withdrawing that original announcement, Minister?

George Freeman: No, I have not. I do not intend to. Dame Ottoline and I are working over the allocation of the £25 billion over the next three years. It is a significant uplift, and I want to make sure that we honour that commitment somehow. If we cannot, I will obviously update the House.

Q465 **Chair:** By anyone's standards, £25 billion is a lot of money. Having singled out £300 million, presumably for good reason—a commitment to that—given that there is a rising budget there, surely the only reason for not doing it is that the Government have de-prioritised mathematics in contradiction to the statement that they made very recently that they wanted to support it.

George Freeman: No, that is not the case. I have given no instruction to de-prioritise maths at all. Clearly, it is not for me to do all the detailed allocations within UKRI. That is for—

Q466 **Chair:** So this was a decision by UKRI rather than you, Minister, was it?

George Freeman: Over the last three or four months, you will appreciate we have gone, following the CSR, through a whole series at a very high level and beginning to come down and allocate across different parts of UKRI. Dame Ottoline and I are looking at where and how we make sure we are doing our best to honour the various commitments that have been made. If we cannot honour that, I will obviously have to come back and explain to the House why not. The key thing at the moment that I want to do is make sure that mathematics as a core

discipline, both within individual research councils and across UKRI, is being properly supported. When I am clear with Dame Ottoline on what she and UKRI are planning to do across mathematics and what the allocations are, I will come back to the House with an update.

Q467 **Graham Stringer:** My understanding was that the £300 million was new money, not a ringfence of old money. Is that the case?

George Freeman: It was not my announcement, but I think that is the case. I am not suggesting it is a ringfence of old money; I am talking about the £25 billion over the next three years.

Q468 **Graham Stringer:** What I want to be clear about is that that £300 million is still new money and we are not doing double-counting with what was a previous allocation. I want, and I guess the Committee would want, a reassurance that that £300 million is still new money that will be allocated.

George Freeman: I understand the point you are making. I am absolutely not trying to do any double-counting. Perhaps, Chair, Dame Ottoline and I can come back to you with a detailed answer on the allocations and where we are on this and on the broader support for maths across UKRI.

Q469 **Chair:** We would be grateful for that. We note your commitment to make a statement to the House if there has been any change to the previous commitment that was made. Perhaps you might address Mr Stringer's question on Horizon.

George Freeman: Yes, of course. Thank you for the opportunity. I have three points to make. The first is that, as I have signalled to you and to this Committee and more broadly, 18 months after we agreed to be in Horizon we are still waiting. Time is running out. I have been in Brussels this week. I have met Commissioner Gabriel and other member states across Europe to signal that if they are serious about their statements of support for UK membership of Horizon, which I think they are, this is the moment, please, to speak to the Commission and to make that clear. The Commission has numerous ways, if it feels the need to punish the UK as a result of the Northern Ireland protocol, and my plea is, "Please, not this way because everyone will suffer and Europe will suffer."

I have signalled that if the phone does not ring in the next few weeks and months, from September we will have to start giving the UK research community some serious reassurance and funding allocation. What I mean by that is—and we have looked at the Horizon programme—we will be rolling out more detail on our so-called plan B. I call it that because plan A remains to associate. That is the Cabinet's position. If we have to begin to go into implementing it, we will roll out a full and much bigger programme of pledges, commitments and announcements, and it will not be plan B; it will become then, sadly, plan A.

I want to highlight four parts. We have looked at the Horizon programme. As you will know, it has a very strong talent pillar, an innovation pillar and an industry pillar. Our plan is to set up a very strong talent piece with very strong fellowship, offer international fellowships that tackle some of the current weaknesses that the research community has told us are in the ERC and some of the issues the Committee has just flagged about short-termism.

The second pillar is that we are going to combine the industry and innovation pillars in a really bold offer around breaking the cycle of short-term funding, much more of a DARPA-style, Wellcome Trust-style, Max Planck-style funding mechanism.

The global pillar is looking at how we can deepen our multilateral and bilateral work across the world to tackle global challenges.

Underpinning all of that is a major investment in infrastructure, which is completely key.

We are in final negotiations with the Treasury at the moment on the detail of how we allocate the funding. You will know the Chancellor has been very clear that the money that was put aside for Horizon research will continue to be ringfenced for research. We would have been putting in £15 billion and getting back—quote, unquote—"£13 billion", and over the next three-year CSR putting in £6 billion and getting back "£4 billion". We are now in the process of looking at detailed allocations across these workstreams so that we have a compelling offer. It needs to be an exciting and compelling offer if we are going to mitigate some of the inevitable damage to the research community in terms of confidence and trust of leaving what has become the flagship programme for European research.

Q470 **Graham Stringer:** Finally, I will put a thought to you, and I would be interested in your comments. I obviously understand that the co-operation between different research people, bodies and universities in Horizon has an inertia to it and has had a certain amount of success. One of the criteria for it was co-operation. On the other hand, there is a world of excellent universities out there within the EU. There are not many, if any, Harvards, Caltechs, Oxfords and Cambridges. The universities in Europe are probably of a lower standard. Is there not a case for saying, while there will be a cost and some pain, we should now be quickly moving to look at worldwide co-operation rather than the restrictions of the European Horizon programme?

George Freeman: Yes, Mr Stringer, you make a very powerful point, and it is one that many researchers and officials have made to me over the last six months. The Horizon programme has become, de facto, the benchmark for European research collaboration, but it is not perfect and it is European. Increasingly, science research and innovation is becoming global. That is why I am genuinely excited by the global pillar.

I have just come back from the G7, where we, America and Japan have been talking about how we can broaden that. If you look at the work that Australia, New Zealand, South Korea, Indonesia and other countries are doing, I am very confident that we can set out a very strong international science and research programme. If we get it right, this will be a moment where our departure from the European Union, which was never intended to be a departure from Horizon, Copernicus, Euratom and the broader engagement, allows us to have one foot in Europe and one foot more strongly in the international research community for the benefit of the UK economy and, as importantly, for the benefit of global science and research.

Q471 **Chair:** Thank you very much. I have a couple of specifics on that. Do you intend to consult the science and research community on the details of the plan B proposal, and, if so, when?

George Freeman: Yes, we already are, Chair. Through the last six months, we have been working very closely with the leaders of the various university groups—the Russell Group, Universities UK, the academies—

Q472 **Chair:** Will you publish something?

George Freeman: Yes, we will. If, as looks increasingly likely from the level of political signalling that we are getting, it looks as though we will have to be ready for plan B, we will shortly be publicising a prospectus to reassure the UK research community principally of what steps we have in place, and we are agreeing that with the Treasury.

Q473 **Chair:** That is in the next few weeks.

George Freeman: Certainly before the summer recess.

Q474 **Chair:** Thank you. Is there a point at which you expect to announce the move to plan B? You mentioned September. Is that in your mind as the date that will be the "go" or "no go" date?

George Freeman: We are discussing this at Cabinet. You will appreciate that there is some fairly high geodiplomacy involved. My strong steer as Minister for Science, Research and Innovation is that September is a natural start point for the academic year, and if we do not get a signal of support within the next few weeks and months, particularly on the fellowships, I want to start by reassuring people that we will have a very strong offer starting from September.

Equally, I want to signal that we are designing this so that we have some third-country participation. Those key Horizon programmes that we have announced will guarantee the funding for this year. If people want to continue under the third-country participation scheme, we will have funding available to support that, and we will phase through over the next year or two into the broader global piece.

Q475 **Chair:** Would plan B begin in September if the decision is that way, or is

September when you will make the decision as to whether to move to plan B?

George Freeman: No, we will be working through the summer on the basis that if the phone has not rung we will start in September to introduce the transition. We have set this out as, first, a funding guarantee for Horizon through the end of the year, and then, secondly, transition so that there is no cliff edge and we go through and we will be in the completely new paradigm of plan B within 18 months or two years. It will take some time to ramp that up.

Q476 **Chair:** So September is when plan B begins.

George Freeman: September will be when the transition programme begins, and then there is a transition through over the next year or 18 months.

Q477 **Chair:** Okay. Finally, with the indulgence of my colleagues, I have two questions for Dame Ottoline. Is UKRI ready to play its part, assuming that it is going to have an important part, in plan B?

Professor Dame Ottoline Leyser: Yes.

Q478 **Chair:** Thank you. That was straightforward. The second thing relates to the point about the maths ringfence. It is notable that the new settlement for UKRI removes many ringfences. We have just seen the consequences of one; that a commitment that has been given to maths is not quite so tangible. There are other ringfences that have been removed for things like the creative clusters and the Faraday battery challenge. How can we be confident that there are not discontinuities in programmes whose only purpose is to be there for the sustainable period in the future?

Professor Dame Ottoline Leyser: Indeed, one of the huge positives from the new settlement is fewer ringfences. I should say we never received a ringfenced sum of money for maths. That never happened. It has always been us managing it from inside our budgets. The Industrial Strategy Challenge Fund budgets are retained in that ringfence, and our commitments to existing funding are part of that retained ringfence. The commitments we have made in the Industrial Strategy Challenge Fund programmes are absolutely in our budgets for this coming spending review.

Q479 **Chair:** Thank you. Do you give weight to the fact that these programmes were intended to develop capabilities over the long term—the creative clusters in particular, geographical locations, and the Faraday battery challenge to build up battery research and innovation capacity? Will you honour the intention that they should be into the future rather than pulling them up by their roots?

Professor Dame Ottoline Leyser: All the programmes were time-limited programmes. That is how they were set up. For each programme, we are considering how best to ensure that the overall objectives are met

and that in the long term the industries of the future are indeed properly supported. There are a variety of mechanisms in place.

The other extremely positive thing from our spending review settlement is a significant increase in the core budget for Innovate UK, which is also in a ringfence. The longer-term vibrancy of a lot of the new industrial sectors created in the Industrial Strategy Challenge Fund should move into that business-as-usual activity. All of this is in the context of the really exciting opportunity for a long-term Government science and technology strategy, which will be incredibly important and helpful in building the innovation-led economy that we are all looking to achieve and in getting us out of some of these cycles of anxiety of funding cliffs that happen with successive spending reviews.

Chair: Absolutely. Dame Ottoline, thank you very much indeed for joining us despite covid. Minister, we are very grateful both for your evidence to the Committee on the subject of diversity and inclusion in STEM and for updating us on some topical issues.