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House of COMMONS

Oral EVIDENCE

TAKEN BEFORE the

SCIENCE AND TECHNOLOGY Committee

ENGINEERING SKILLS

Wednesday 7 NOVEMBER 2012

GEORGIA TURNER, GEORGIE LUFF and KIRSTY ROSSINGTON

JIM WADE, LIZ ALLEN and MAGGIE GALLIERS

Evidence heard in Public Questions 40 - 131

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Oral Evidence

Taken before the Science and Technology Committee

on Wednesday 7 November 2012

Members present:

Andrew Miller (Chair)

Jim Dowd

Stephen Metcalfe

Stephen Mosley

Pamela Nash

Graham Stringer

Examination of Witnesses

Witnesses: **Georgia Turner,** Student, JCB Academy, **Georgie Luff,** Student, Newstead Wood School, and **Kirsty Rossington,** Substation Apprentice, National Grid, gave evidence.

Q40Chair: Can I say good morning to the witnesses and welcome to Parliament? I want to start off by formally asking you to introduce yourselves, and we will ask a few questions.

Kirsty Rossington: I am Kirsty Rossington. I am currently a third-year apprentice working for National Grid, and I am based up in the north-east near Teesside.

Georgie Luff: I am Georgie Luff. I am in upper sixth, year 13, at Newstead Wood school for girls in Orpington. I am studying maths, further maths and physics.

Georgia Turner: I am Georgia Turner. I attend the JCB Academy and am in year 11.

Q41Chair: I want you to start off by telling us a little about the work or study that you are doing at the present time, just so that we have a flavour of it. I will start with you, Kirsty, because you are in a quite different role; you are now working and so on. Tell us about it.

Kirsty Rossington: I have done two years of my apprenticeship already; it is a three-year course. As to qualifications, during the apprenticeship I have just done a City and Guilds and am midway through doing a Level 3 NVQ as part of the course as well. That means I am at the training centre for some of the time doing my qualifications and courses for the job, and then I am out on site putting all that into practice. The majority of my third year is now on site to complete my NVQ.

Q42Chair: But you didn’t start off as an apprentice, did you?

Kirsty Rossington: For National Grid, yes.

Q43Chair: But you have done things before that.

Kirsty Rossington: Yes. I took a bit of an unconventional route into it. I actually went to university after I did my A-levels and then came back and started my apprenticeship afterwards.

Georgie Luff: As I said, I am taking maths, further maths and physics at the moment. I am still taking my A-levels; it is all very work-based and not practical-based, because I didn't have room to take any design A-levels as well. But I am also taking further mechanics classes because I feel that is the link to engineering at university that I need, and I really enjoy it. I am enjoying my subjects and I can't wait to study engineering further.

Georgia Turner: I am doing an engineering and business diploma along with English, maths, triple science and religious studies. I am also doing an NVQ in German and Mandarin at the moment.

Q44Chair: The second question I want to ask you, and then I am going to ask my colleagues to chip in, is what inspired you to study the fields you are studying now. What was the on switch, if you like, especially, Kirsty, because you have changed direction? What inspired you to make the change you have taken?

Kirsty Rossington: I did my GCSEs at school and ended up going through and doing my A-levels. I wasn't really sure what I wanted to do and ended up going down a sport route. I enjoyed sport at school; I did PE A-level and ended up going to university. I got about halfway through my degree and realised it wasn't what I wanted a career in. I had done a few work placements in various things, such as sports developments, and realised it wasn't what I wanted; I didn't want a career in it, so about halfway through I started looking at my options and thought I would have to rethink it; so I had a bit of a rethink.

Georgie Luff: I always loved design and technology at school, so when I came to choose my GCSEs and school offered an engineering diploma I jumped at the chance of taking it, because for me it was the idea of going to college alongside school and using all their equipment and the practical side to it. I thought I would give it a go. Just before I definitely decided to take it, my physics class offered a trip to a lecture on the Bloodhound supersonic car. I went along, and it just was absolutely fascinating. For me, that was the turning point that I had to study engineering, build cars and race them across the world. After all the experience I have had I have moved slightly away from cars, but that was definitely my turning point and the thing that made me want to take engineering as a subject.

Q45Chair: So we are not going to see you as the first female F1 driver but you will be the first top designer.

Georgie Luff: Definitely.

Georgia Turner: I have always grown up around engineering. My brother is at university doing engineering, and my dad works within the JCB so he is very much in touch with the engineering side. I have grown up close to JCB as well, so I saw machine after machine drive past my house when I was little. I have always sat at home drawing and sketching, little things like a kettle or anything like that. I am really interested in drawing. In year 8 I won a design and technology award and that was when I was spurred on to carry on and do design and engineering for my future.

Q46Chair: Having the JCB Academy on your doorstep must have been a complete gift.

Georgia Turner: Definitely, yes.

Chair: When Xameerah and I went to see the school the other day, the first thing I said when we left was, "I want to go back to school."

Q47Stephen Metcalfe: Of the subjects you have studied over your educational career so far, which do you think are most important to building a foundation on which you can then go into engineering?

Kirsty Rossington: My science and maths GCSEs. I can definitely see that now coming out during my apprenticeship. I did technology as well while I was at school; I chose woodwork. Especially in the first year of my apprenticeship, a lot of the hand skills I was learning and developing mirrored what I had already done at school. I had already had a taste of that, so it was definitely those three.

Georgie Luff: For me, it has to be maths and physics. They are the non-practical side of engineering, but they are the basics and the building blocks of everything you need. You can't go and design without understanding, and I am only just seeing now in my A2s that the maths and physics I have learned over the years are finally coming together in a practical sense, especially, as I said before, with mechanics. I don't think you can be an engineer without that prior knowledge, so they are definitely the key ones.

Q48Stephen Metcalfe: But do you think you need physical, practical skills as well?

Georgie Luff: They are helpful but not necessary. I have had practical skills and have done a lot of design. It is really extra projects more so than taking a design and technology qualification. The practical skills you can build over time and they are things you can quite easily pick up, but if you don't understand the basics of momentum, say, you will never be able to design something that physically is going to work.

Georgia Turner: Maths, physics and the sciences are really important, but you also need to know English for communication. Without communication, the product is never going to be built, end of story. We do a lot of practical work at the academy. Without that I don't think I would have been able to do our challenges in as much detail, because you don't understand the procedures you have to take to manufacture.

Q49Stephen Metcalfe: You have all heard of the English baccalaureate, which will focus on English, maths, the humanities and the sciences. At the moment it doesn't include any kind of practical, engineering or design technology-type qualification. I think you said you had done design technology at GCSE.

Georgie Luff: I took the engineering diploma.

Q50Stephen Metcalfe: Would you have made space for that if the focus had been more on the English baccalaureate?

Georgie Luff: Sorry?

Q51Stephen Metcalfe: I am sorry, yes. Let me put it in a clearer way. My concern-tell me whether you agree with me-is that, if schools are judged on the English baccalaureate, and so English, maths, the sciences and humanities is where the focus for the school is, is there a danger that you would be pushed towards that rather than perhaps doing some of the more practical subjects that might help to encourage or inspire people to do engineering?

Georgie Luff: Definitely. If the school is being ranked on its English baccalaureate, it is not going to be pushing for subjects that aren't putting them on the league tables. Part of the reason I took the diploma is that Newstead is an engineering specialist school. It pushed it and told me the positives of taking it and where it could lead me, but if someone hadn't stood there and told me, "This is what an engineering diploma can give you", I wouldn't have taken it. I think schools will move away from that if more emphasis is put on the more basic English, maths and humanities.

Q52Stephen Metcalfe: Outside maths, physics and science, which I think you have all agreed are very important, is there one other subject that you would like to see pushed or promoted that would help people get a better understanding of engineering?

Kirsty Rossington: I would say engineering as a subject. I know a couple of friends' brothers and sisters who are at school now and are getting an opportunity to select it as a subject. I never got that option when I was at school. If it was there today, I imagine that as a whole it would give you such a broad base to lead on from.

Georgie Luff: That is exactly what the engineering diploma did for me. It covered every aspect of engineering I could have at a basic level so that afterwards you can go into your A-levels choosing subjects that help you progress into engineering as a career. I just think it is the most fantastic thing that I did.

Georgia Turner: I went to JCB because of the engineering diploma, and it has definitely given me a wider range of ideas myself and understanding.

Q53Stephen Mosley: Could I pick on Kirsty first-in a nice way, I promise you? What made you decide to go and do an apprenticeship?

Kirsty Rossington: Really just the idea that I could still get more qualifications but learn a trade at the same time; to do a job that means something; to be able to go in to work in the morning and leave knowing I have made a difference to something myself; I have changed something for the better, rather than, when I was at university, my options were office-based generic jobs that I didn't necessarily need my degree for. The fact I could learn something like that really appealed to me.

Q54Stephen Mosley: How did you find out about the opportunity at National Grid?

Kirsty Rossington: It was my dad. He had just completed his 40 years with the company. He started as an apprentice at 16 and has worked his way up. He was my inspiration and just mentioned it as an idea to explore.

Q55Stephen Mosley: How did you find it going to that interview, because I guess it is quite a male-dominated career and company, isn't it? How did you find it as a young lady?

Kirsty Rossington: It was okay. Even now some people ask me, "How is it working in such a male-dominated environment?" On my site I'm the only girl, but, to be honest, it doesn't make a difference at all; everyone is treated the same; we do the same work. It doesn't make a difference. So, yes, it's great; I love it.

Q56Pamela Nash: I want to ask each of you about careers advice. You are all at different stages in your academic careers. We didn't really have the careers advice. In the environment I grew up in 10 years ago, if I had said I wanted to be an MP, I am sure I would have been laughed out of the building-maybe even a couple of years ago as well. I want to ask each of you what your experience has been of careers advice. Was it provided within your school or at university, was it external, or did you have none at all?

Georgie Luff: Mine was during school. It started in year 10. We had a careers adviser at school. We went along to a meeting and talked about the subjects we enjoyed. They generally head you in the right direction. Then they get you an organised two-week work experience placement in year 10 on something you think you might be interested in, just to give you an idea. Mine was an engineering placement because I told them that I liked maths and physics, so they pushed me towards that. After that, I went back to school and said to the careers department, "I loved it; it was fantastic. Can you give me some more advice?" They went through university degrees and all the routes into engineering you could do.

The engineering diploma also had a careers section where you could find out about being an engineering technician or take a degree, and it explained the difference between bachelors and masters. It was all laid out for me. School played a massive part in it. Then I took another work experience placement in year 12, which we had to organise ourselves, but the school pushed you to do it. It was all internal for me.

Q57Pamela Nash: Just before I move on to the other witnesses, you mentioned that your careers adviser had a good understanding of what it took to do an engineering degree. Did you feel that they had a good understanding of what possible careers you could go into beyond that degree?

Georgie Luff: I say "definitely". Most of the time they said that, if you took an engineering degree, basically it would take you anywhere. I could go and work in the City; I could work in an engineering firm; I could work abroad; I could be a designer; I could do anything I wanted, which was what appealed to me. At the time, although I knew I loved it as a subject, I didn't know that was what I wanted to do for a career. When you are 13 or 15 years old you don't know what you want to do for the rest of your life, so the fact they told me that engineering was something that could take me anywhere was what pushed me to taking that.

Georgia Turner: I had careers advice at school. That was the real place I had it. We had work placement for a week in year 10 and I went to JCB and did design, which I asked to do. I absolutely loved it. About two weeks ago I just finished a second placement. I went to JCB but to a different factory. I enjoyed that again. Also on work placement they give you quite a lot of careers advice there as well. The book we fill in asks you what the people you work with did at uni and everything like that. I learned a lot then, and it definitely steered me in the right direction for what I wanted to do.

Kirsty Rossington: The careers advice I was given was from an external company while I was at secondary school. Basically, it involved a one-to-one 10-minute meeting to discuss your

options. The only information she really had about me as a person was the grades I was getting at school. She based it upon that. She saw that I was doing well in all my subjects and said, "You could do your A-levels and go to uni; you're capable of doing it." She didn't really explore any other options for me, apart from that; she didn't know what I enjoyed. She literally just had what was on the paper.

Q58Pamela Nash: That sounds very familiar. That is exactly what happened to me. Did you have any careers advice when you were studying sports science?

Kirsty Rossington: No, nothing.

Q59Pamela Nash: I was surprised and delighted that we have an all-women panel. In any inquiry the Committee are doing I don't know that we have ever had an all-women panel made up of more than one witness. It is really nice to have you all here today. Can I ask about your schools? How many girls are doing the subjects that you are doing? What was your experience going through school as well? What we are trying to get to the bottom of is how we can get more girls to do these subjects, so any insights that you have into that would be helpful.

Georgie Luff: We have a full class at my school for the year 10 and year 11 engineering diploma. For year 12, probably 20% of physics and maths classes are girls. Even though it is an all-girls school, it has a mixed sixth form. Quite a lot of the physics and maths candidates are boys. Those are the subjects a lot of them have come into the school for, which surprises me because, being an all-girls school, I thought we would have many more girls in it. I just think it is a subject that people are not overly enthralled by. I don't know. I love it myself. I just think that people see an aspiring career as medicine and law, and engineering isn't something girls think of. Even at school people say to me, "You want to take an engineering degree. What are you going to do-work on cars and be a mechanic?" They just don't understand what it entails. Until you educate people as to what they can do with it, they don't want to risk putting themselves into that niche and just take maths and physics. They are not easy subjects.

Q60Pamela Nash: Do you think there is a lack of prestige associated with engineering?

Georgie Luff: Definitely. There are so many awards, scholarships and things available, but people don't know about them, so they don't find out how engineering should be something to aspire to, not something that you do if you can't be a doctor or lawyer, in my opinion anyway. It is not recognised so much in this country.

Georgia Turner: There are six girls in my year who are students in my year, so we are very much the minority. In year 10, there are about 10 girls of about 130 students in total. We definitely don't have many girls in engineering, but at least it is an increase on what we had in our year. When I left my old school, all my friends were definitely under the impression that I was going to build diggers-that was all I was going to do-and then take some exams afterwards. It's not right in a way because they don't realise what you have to do to be an engineer. They think I am going to build cars or something like that. They are so naive about engineering as a whole. If they were given careers advice where they saw what we get to do, maybe they would think differently, but engineering isn't viewed positively among girls because they want to do something in London, or wherever they want to be.

Kirsty Rossington: I would absolutely agree with the previous comments. Still none of my friends know what I do.

Q61Pamela Nash: I was just going to ask what your pals said when you told them you were going to National Grid.

Kirsty Rossington: "Is that water?" They still don't know. Quite often, they associate it with construction; they assume I am on a building site. They see that I've got a white hat to wear. They just don't know unless they ask questions. When I did my technology GCSE, there were only two girls in that class of about 40. In my apprenticeship intake, there are 19 of us and two of them are girls, so we are definitely still a minority. I just don't think they know about it. When I had my careers interview I didn't know it was an option for me. It was never mentioned even to explore it. I loved my technology. Maybe if she had seen that in me, she would have been able to mention that I could go this or that way. As a 16-year-old I didn't know what it was; I didn't even consider it. A lot of my friends are still like that now, or they assume engineering is dirty work. They think that if I work with oil I will come out covered in oil, but it's not like that at all.

Q62Jim Dowd: Would you expand on some of the answers you have all just given? Do you ever feel odd, abnormal, as girls-women-in engineering, given the numbers you have just given? Do you ever feel that all the other girls have got it right and you have got it wrong?

Georgia Turner: No.

Georgie Luff: No.

Kirsty Rossington: No.

Q63Jim Dowd: But you don't know why it is they don't see it the way you see it.

Kirsty Rossington: I do know why; it's because they don't know, but I am proud to describe my job to people and see their reactions. I am proud of what I do; I love it.

Q64Jim Dowd: But your dad was doing it for years beforehand anyway, so you had a background or acquaintance with what you would like to do.

Kirsty Rossington: Yes.

Q65Jim Dowd: This question applies to all three of you. When it was suggested to you that you might pursue engineering as a career for your professional life, did it strike you as novel and something you had never thought of before, or did it accord with something you had felt for a very long time?

Georgia Turner: I had always thought of going into design, even when I was really young. I always wanted to do drawing or sketching, so, for me, engineering was the obvious answer. I never thought, "I'm not sure about that," or, "Oh, that's a bit different;" I definitely wanted to go for that.

Georgie Luff: For me, it was quite the opposite. As soon as I heard you could be an engineer I thought, "Run away now." I had the impression that I would be a mechanic covered in oil,

just like everyone else thinks. Until I did my work experience and saw what a work placement was like in an engineering company, I just thought I wanted to take an engineering degree because I liked the subjects and topics covered but I don't want to be an engineer. I would rather use my skills maybe to go into the City and make loads of money. But it turns out that engineering is what I like. The reason people don't know about it is because it's not pushed. Work placements, for me, are the things that open people's eyes. If more girls were pushed into work placements or shown work placements by employers, then we would have a higher uptake in maths and physics.

Q66Jim Dowd: A work placement is quite late in the day, isn't it?

Georgie Luff: It was in year 10; it was before I had even started my first year of GCSEs.

Q67Jim Dowd: We have seen and heard evidence from people who say that, whether it is girls or boys, male or female, you need to get them studying particularly the sciences early on in their careers so that they have the qualifications. Leaving it until you get a job placement is a bit late, isn't it?

Georgie Luff: Maybe my suggestion would be to get female engineers to come into schools and give inspirational talks, rather than dragging you out to a work placement.

Q68Jim Dowd: There are hardly any of you; they are all busy working.

Georgie Luff: I know, but they could spare an hour or two at a school just to inspire those young engineers. If you don't get people to come in and give you the information, you can't learn and become an engineer yourself; you need to be taught.

Q69Jim Dowd: You mentioned teaching engineering as a subject. There are all kinds of engineering. My background is that I was an electronics engineer. If you got covered in oil doing that you were in serious trouble. You mentioned the principal subjects of physics and maths in particular. Is it anything to do with the way those subjects are taught compared with arts subjects?

Georgie Luff: That is what puts people off. I don't think it is how you teach it; it is the content and the fact that it is quite difficult to understand. You need to knuckle down and practise it and apply it. For an arts subject you can read a book and understand it; you can read a revision guide. For engineering subjects, you need to read it and practise it. If you are not willing to put in the work, you will not do well in it, which is probably something else that puts people off.

Georgia Turner: From an early age, the impression of maths is that it is quite hard; sciences is quite hard for the majority of students. Lessons are normally sitting down and reading from a textbook or copying down from the board. Especially at my old school, that was what it was like. Before you even start high school you have this impression in your head, "Oh, it's another science lesson," or, "Oh, it's maths. I really don't want to do it but as long as I pass I'm fine."

But at the academy I am enjoying those lessons a lot more. The teachers think outside the box. So, instead of just learning about trigonometry, they put it into a situation that you would be familiar with. It helps you to learn it that way so that when you go into the exam

you are more familiar with the content. Even though it may be written differently, you are more comfortable doing it. You remember little things they have said that help you through the exams. It is not just the exams; it's the life as well.

Q70Jim Dowd: It is the mixture of theory and practicality.

Georgie Luff: Yes, which is why the engineering diploma is fantastic. It gives you the practical side and the actual information you need all in one. You learn it and then practise it for a module. You do that for eight modules over two years. By the end of it, you know everything. It's great.

Kirsty Rossington: It is important to remember that it's not just academic qualifications that you need to be able to get into engineering, especially to do an apprenticeship. The entry level is grade Cs in maths and science and it is important to attain those, but probably what you do outside school is more beneficial to you. Definitely when I had my interview for the apprenticeship I needed the basic entry requirements, of course, but the questions were based on what I did in my spare time-the way in which I already used the skills that I would need for the job. That didn't necessarily come from school subjects; it was outside that. It is definitely important to remember that.

Q71Jim Dowd: Beyond some of the items you have already mentioned, is there anything further that you think needs to be done to encourage the take-up of engineering as a subject by young people, and young women in particular?

Kirsty Rossington: It is just greater awareness of it. From personal experience, I didn't know I could do it. Nobody mentioned it to me until I was able to go back and do it after university. At the moment, through National Grid, I am taking part in a mentoring scheme. I have been assigned to a year 11 student. I am just waiting for the CRB check to go through so I haven't met her yet, but I will be meeting with her every week just for half an hour or so to have a chat. She has been identified as someone who may not be in education or employment when she leaves school. For me to be able to go in there from a company, from an industry point of view to talk to her, she can see first hand that that is an option. She can just have an informal chat with me.

I am also doing an assembly with another apprentice I work with who has just finished his time. We are both going to our local secondary school in a couple of weeks to do a careers assembly as part of National Grid to let them know this is what you can do. If I had had things like that when I was at school-just a little spark or thought in my head that perhaps I could do it-and someone was standing in front of me who had done it, it would have been really good.

Georgie Luff: I think the extracurricular projects should be pushed more. I have done the EES-the engineering education scheme-and took part in the GreenPower Challenge where you build a car and race it. All these things instigate such an interest in the subject that they are the things that need to be pushed from a younger age. At our school there is something called LEGO LEAP for years 8 and 9.

Q72Jim Dowd: It is called what?

Georgie Luff: LEGO LEAP. It uses software. I am not part of it. I am year 13, not years 8 or 9. It uses LEGO to design robots and then software to program it, and it performs tasks. From the age of 14 they are learning how to program. In my year, for the engineering education scheme someone taught themselves C codes to build a buggy that would follow a soldier. Things like that, which are different from what you do at school and are exciting, are the things that should be pushed because they are the more real-life situations that show you engineering isn't dirty work and it really is thinking and problem solving that you need to develop.

Georgia Turner: When I was in year 10 there was a group of students, probably in years 6 or 7-all girls-who came to the academy and did a Girls in Engineering half-day, along with the old year 13 girls who were there and some of the engineers from Challenge partners who we are with. They did little tasks. They had to build a buggy and put an egg in it. It had to go down a ramp and not break the egg. They all thought it was really fun, and things like that they then related to engineering, instead of thinking that you would be under a car fixing exhausts or something. From that early age they got an impression that was completely different from what they were thinking and my friends are thinking now.

Q73Jim Dowd: As we move from manufacturing to a more service-based economy, is engineering stigmatised as being old-fashioned and out of date, whereas being able to speak into three telephones at once and get £100,000 a year in the City is a much better proposition?

Georgie Luff: It does sound better when you put it like that, doesn't it? These days, people are seeing engineering more as a developing subject. If you think about it in the workplace, I don't know about people that don't study engineering, but I see it moving towards electronics and high technologies, maybe moving to the moon, for example, or just crazy things you wouldn't have expected to do years ago. In my eyes it is not old-fashioned; it is something we are moving towards and developing all the time. If you don't have an engineering background, maybe you wouldn't see it as that and you would think about steam trains, the industrial revolution and dirt.

Jim Dowd: The three of you seem to be hung up on cars, exhausts and oil. I am sure a lot of people don't have an interest in it, but never ever forget, of course, that it is engineers that make the world go round.

Q74Stephen Mosley: Georgia and Kirsty, you both talked about family members who had been involved in engineering. Georgie, I know you talked about people coming to school and inspiring young ladies to do engineering, so it sounds like role models are important. Not just thinking about the girls you are at school with or work with but across the board in terms of doing engineering, how important are role models to encourage young people into engineering?

Kirsty Rossington: They are vital, especially if a girl hasn't had the opportunity to think about it as a career herself. If someone is already doing it, it is much easier to be able to see yourself doing it. You can see that someone else has already been successful, especially when you are talking about careers events and things. If you are not sure what you want to do, you need that little bit of a spark to tell you that you can do it; it is an option for you. If you have a role model who is already doing it, enjoying it and loves it and can share it with you, it makes it much easier to see yourself in that situation.

Georgie Luff: You need a role model for anything. People wouldn't start playing football if it wasn't for David Beckham. You need astronauts to inspire new astronauts. You wouldn't go into anything unless you had someone telling you it was great. It is not just engineering that needs role models.

Georgia Turner: My brother is definitely an engineer, given the way he thinks and acts. He is six years older than me. Before I could even walk I saw him building things. I have always seen someone who is really interested in things like that as a role model. That is where my passion for design and engineering came from. I didn't realise until I was a lot older that my dad worked for JCB. I was quite oblivious to what he was like when I was younger. Then I realised that what my brother was doing would lead to something like JCB. It is the way forward, because everything expands and makes the world go round.

Q75Stephen Mosley: So among your peer group who are the current role models?

Georgie Luff: In engineering or generally?

Stephen Mosley: Engineering.

Georgie Luff: There aren't any. People don't know about engineers.

Q76Chair: Is that partly because of the way the media treat engineering? I have done a few events here where I've had people like Brian Cox in, and suddenly my parliamentary colleagues are all interested because of the great image that he portrays about physics. Is there a gap? Do the media need to wake up and realise that engineering shouldn't be presented by clowns like Jeremy Clarkson but in the way that the BBC presents it, for example, in its two very good programmes on Airbus and Rolls-Royce? I don't know whether you have seen them, but I thought that was a much better way of presenting modern engineering than trivialising how and why cars go faster.

Georgie Luff: If it was shown more on telly, which everyone watches, we would have more role models and more interest, and we would spark that interest from a younger age, but the fact that there is, basically, a lack of coverage of engineering means you can't expect people to know about it and go into it.

Kirsty Rossington: I absolutely agree. I am sure that National Grid is a representation of engineering as a whole, but there seems to be a big gap between engineers that have worked there for a long time-people like my dad-and apprenticeships and training programmes and getting people to fill that gap. In between there is not very much. I think that as a whole it is seen as an old industry-that the equipment we work on is old, and at the moment there is nothing out there to bring it into focus.

Q77Chair: You see the products of engineering frequently but not how people are inspired to create things.

Kirsty Rossington: Yes, but there should be more out there saying to people that it's not an old industry; you can do it; it is fresh and modern-things like the girls are doing at the moment-but unless people know about it they don't see it.

Q78Chair: Let me put it slightly differently to you, Georgia. Your school is in a building that I found quite inspiring because of its history. It is in Arkwright's original mill. As someone who is interested in science and engineering and our industrial heritage, I felt there was a buzz in that building. Don't you feel that?

Georgia Turner: When I walk over the bridge and over the Archimedes' screw, which is always generating the power we have for the school, I know I am somewhere special. No real school has what we have at the academy. You walk through and see the modern and the old. You have the old archways from where the wheels used to turn, and you definitely know that you are in an historical place but you are also making history yourself. I like being there. We've got machinery that was donated; we've got old traction engines and things like that that are really old. You are allowed to go and touch them and maybe turn them on. You've got an opportunity that no other students have. With the history, we almost have more drive to succeed in what we want to do, because we don't want to leave a bad impression behind us on such a good building and school.

Q79Stephen Metcalfe: Going back and touching on what Stephen was talking about a minute ago-about promoting engineering-every time you turn on the television and watch an advert or see a Formula 1 race they are great examples of engineering in action. A man jumping from a balloon on the edge of space is engineering in action; every time you see an iPhone or iPad advert it is engineering in action, and yet people don't seem to see that that is part of engineering, which I suspect probably inspires the majority of people to go into engineering rather than lying under a car changing the oil. Do you think there is a role for engineers in general-people who have grasped its value and what it can achieve-to get out into schools and promote it on a vast scale? Do you think there is a duty on engineers to take their enthusiasm for the subject and inspire primary and secondary school students so that they understand the connection between the product they probably have in their pocket or bag and how it got there? Do you think you should also make that your challenge as you grow into your careers in engineering?

Georgi Luff: I think anyone in our career should be pushing for the younger generation to follow in their footsteps and improve on their work. As we have a lack of engineers in this country, it should be the current engineers' job to come in and inspire new ones. That is probably the missing link at the moment. If we did have a couple of engineers from every company across the country going into their local schools, we would spark up so much interest in it, and it could lead to work experience afterwards. The possibilities are endless, if you just got a couple of people to take the time to go and talk to some young children.

Kirsty Rossington: Absolutely; I totally agree with that. At our training centre at Eakring we often have people coming on work experience. We get groups of schoolchildren coming. It is great to see them there doing the work. We have a little wooden village. They connect it up and make it all light up. There are simple things like that that they can get so excited about that maybe they don't even realise that it is engineering. It's brilliant. If an engineer has been in the job for 30 or 40 years, his enthusiasm for it would naturally touch everybody in the room. They would be able to see it just from his talking about it or showing them something. It would be brilliant.

Q80Stephen Metcalfe: There are some brilliant examples out there, and that is one of them. My concern is that it gets out to the few schools locally to you; it doesn't get out to all 25,000 primary schools and 8,000 secondary schools. To inspire a generation of engineers, we need

to get out there and get into every school, and not in a particularly glamorous way-just go out and explain to people that that's engineering. So you are going to go and do that.

Georgia Turner: I would if I could.

Stephen Metcalfe: Brilliant; thank you.

Q81Stephen Mosley: We are getting to the end, and normally the Chair asks a windingup question along the lines of, "Is there anything else you'd like to add?" Before he does that, may I ask a specific question of Georgie and Georgia? We have your head teachers appearing before us after this. Are there any questions that you think we should be asking them?

Georgie Luff: I think you should be absolutely ribbing them; get the most out of them that you can. Definitely keep asking questions about their opinion on the diploma and how we can improve engineering at a young age between years 7 and 9. For me, that is the key to getting fresh, young engineers into it. Get their opinions on that.

Q82Jim Dowd: Where did you go to primary school? Newstead Wood is in Bromley or Orpington, isn't it?

Georgie Luff: I went to Hayes primary, which isn't too far.

Q83Jim Dowd: Did they do anything there along these lines?

Georgie Luff: I didn't really start engineering there.

Q84Jim Dowd: Newstead Wood has been an entire voyage of discovery for you.

Georgie Luff: It has; it has opened so many doors.

Q85Chair: The final question is about the diploma. There has been lots of talk about the future of the diploma. If it was determined to be worth only one GCSE, would you have done it?

Georgia Turner: We do a lot of work to get the diploma; it is page after page and hours are spent in getting the diploma in the end. The amount of work you do is worth the current amount of GCSEs.

Q86Chair: And you do more hours than most schools.

Georgia Turner: Yes. I really enjoy it. If it went down to one GCSE, I really enjoy it and I think I would still do it, because you are still getting the name of the engineering diploma, aren't you? Maybe the quantity of GCSEs won't be enough for some people. If it was only one GCSE, maybe they would want to go and do art or something like that instead. They might want to do that instead.

Georgie Luff: Personally I would still have taken it purely because our school is an engineering specialist school. One DT is compulsory, so I would have taken engineering or design technology of some sort, but I will admit that there were 16 people in our class and 13 of them took the diploma because it was worth that many GCSEs. We would have had a class

of three and that wouldn't have run; there would have been no diploma. Taking it down to one GCSE would stop people from taking it; it really would.

Chair: Thank you very much for coming to see us this morning. It has been extremely helpful. You are of course welcome to stay in the room.

Examination of Witnesses

Witnesses: **Jim Wade,** Principal, JCB Academy, **Liz Allen**, Head teacher, Newstead Wood School, and **Maggie Galliers,** President, Association of Colleges, gave evidence.

Q87Chair: May I welcome the second panel here this morning? Just for the record, I ask you to introduce yourselves.

Liz Allen: I am Liz Allen, head teacher of Newstead Wood school in the London Borough of Bromley.

Maggie Galliers: I am Maggie Galliers, President of the Association of Colleges and Principal of Leicester College.

Jim Wade: I am Jim Wade, Principal of the JCB Academy in Uttoxeter, Staffordshire.

Q88Chair: At what stage in the education process is it most vital to engage students in STEM subjects, particularly engineering? Is it primary, secondary or a mixture of both?

Maggie Galliers: I would say the earlier the better, because very young children can learn to build and design and enjoy working with the kinds of materials that would lead to an engineering career later on. Certainly, there is a place for encouraging people in primary schools to think about these sorts of things, but also very specifically in secondary schools, making sure there is impartial advice and guidance. The young people did a splendid job in spelling out what kinds of things really motivate and spell out options, and perhaps what kinds of things close down options.

Jim Wade: My view would be that, yes, it needs to start early, but at the same time there needs to be a clear progression as you move through so that youngsters at a very young age can see what those options and choices are. Potentially, they can see other people-their older brothers and sisters and others-doing those options and getting that interest. There is no point sparking that interest with a 7 or 8-year-old if there is nothing they can go and do in relation to that until perhaps they are 19.

Liz Allen: A child in a sandpit in pre-school is engaged in engineering activity. What we tend to do in the education system is start to put limits and boundaries on that and turn it into content, dissociating it from the activity in the sandpit. I think a big lesson we have to learn as educationists is that we must keep that application of knowledge always, always, from the start, at the forefront. My big bugbear about maths and science at key stage 3 is that it becomes terribly content-driven. I see lots of inspiring science and engineering work happening in key stage 2 in primary school. It is really adventurist, discovery stuff, but then we put it into subject compartments in secondary school and start limiting it by accreditation systems and specifications. There is a big responsibility on educationalists to keep that application of knowledge all the way through from the sandpit to the university.

Q89Chair: It is interesting that you should say that. Two nights ago, a primary school in Belfast was awarded the Rolls-Royce prize. Interestingly, it was the inspiration of the teachers who understood what you were saying, not because they particularly had science qualifications themselves. I thought that was a really good lesson for the educationists.

Liz Allen: Frequently, they are more creative. One of the issues with subject specialism is that it can limit what a teacher covers. Sometimes the generalist and the excited and interested person is more creative in the opportunities they offer to young people. Another area that concerns me hugely is the training and professional development of good engineering teachers, particularly in the secondary sector. There just isn't a focus.

Q90Chair: What are the barriers that stop students pursuing engineering in school and in terms of future careers?

Maggie Galliers: Sometimes it is about advice and guidance not being broad enough. My association did a survey relatively recently among young people. Only 7% were able to name apprenticeships as a possible post-16 route, whereas 63% were able to name A-levels. There is a duty on schools and others to make sure that the advice and guidance young people receive is genuinely impartial and looks at all the options. There is a duty on educationists-schools and colleges-to make sure that we provide those kinds of role models, challenges and opportunities to experience hands-on work that will enable young people properly to understand all the options available to them. As an association we have a concern about that, because the duty of the careers guidance has been put on schools without necessarily the resources to do the job we would all want them to do.

Jim Wade: In part, there is a lack of effective careers and educational guidance in those areas and a lack of role models visible to youngsters. There is also a lack of provision to a certain extent that encourages youngsters to go through and do things. Obviously, the JCB Academy is a very special place, but at my last school of which I was head we ran engineering. The students used to make such fantastic things that the other students used to aspire to go on to that course. If we hadn't had that course at the school, there wouldn't have been that inspiration that provided for other young people. It is partly about career guidance and partly about role models, but by and large we don't have a provision for engineering within most mainstream schools. Therefore, I don't think that encourages youngsters to think about that as they are going on through. The organisation then doesn't have anybody who is an expert within engineering, within that organisation, to be selling it to youngsters in their school time.

Liz Allen: It takes an immensely brave-some would even say foolhardy-school leader to attack social conservatism among teachers and parents, because you are putting quite a lot of your school's reputation at risk by doing so. Newstead is in a leafy part of south London and is assumed to be in the heart of middle-class conservatism. 50% of our children are from ethnic minorities; a good 60% are from Lewisham, Greenwich, Crystal Palace and so forth. We have a huge social and ethnic mix, and there is a considerable amount of conservatism, as Georgie was saying, about whether able girls should go into anything other than medicine and law.

In taking on the engineering specialism, Newstead faced a huge amount of parental flak for that. They didn't think it was appropriate. We need pioneers and confident people who are prepared to break moulds and say, "These are the opportunities." We are fighting huge social conventions about gender and ethnicity in doing so. As we have been saying all morning, we

need flagship, brave ambassadors to go out and break those moulds. The young people you have listened to are those pioneers.

In introducing the engineering diploma at Newstead, we have been successful at level two, as Georgie said, but at level three we have been unsuccessful. The students want to do it at level three, but parents refuse to allow them to do it because it's not appropriate for girls; they should follow the conventional and traditional route that maths and physics lead to. People like Jim and I have to be heroes about this and stick up for it. I am sorry this is a long answer. If we had the right messages coming from Government that said these pioneers are doing the right thing-just a few messages that might seem like the good guys-it would help us enormously and perhaps persuade parents to trust our judgment.

Q91Chair: What are you doing to help change the attitude of parents? It is quite clear from the evidence we have heard just now that there is some real enthusiasm among the students. They have got their sights fixed on very prestigious and pretty well-paid careers, so how are you trying to break down those barriers?

Liz Allen: It is a huge task because it is changing the whole approach to learning. Our whole approach particularly is to help able girls, so it is a much bigger picture. Other things are happening. We have been at it for 10 years and are just beginning to feel that we are succeeding, so it's a long haul. It is about building, creativity, problem solving, personal learning and thinking skills, but also self-esteem and confidence to take risks, to persevere, to take on challenges, to innovate and make a difference. There was a lovely comment from Kirsty. Young people want to make a difference. In engineering you can do that almost better than anything else. It is a long haul, and it is changing the culture of a school to be open and coconstructed so that everybody's opinion matters. It is a big ethos shift in the whole school.

Q92Chair: Mr Wade, in your case you are encircled by some of the biggest names in engineering: JCB, Rolls-Royce, Toyota and so on. Some are your sponsors. Is there a different culture there because of the history of the local community, or are there similar traits?

Jim Wade: I would say there are still some similar issues. One of the things that is still true of our organisation-I don't know whether it is also true of Liz's school-is that a lot of our students have some connection to engineering, which is why they have chosen to come to our school. It may be a father, brother or uncle, or somebody who has sold it to them as a potential career.

I know you visited us. Picking up on Liz's point, we set out to try to be an inspirational place to go to. Our view was that, even if you didn't go there, if you looked at this place you would say, "Wow! Engineering must be important if they have done it with this grade II listed mill." We almost set out to do that, because we were very conscious that the message we needed to send was that it was an inspirational place that you might aspire to go to.

Q93Chair: I just wonder whether there is an opposite effect from what Liz Allen described. For example, I observed the English class doing "Romeo and Juliet", in a very clever way, engaging with issues of conflict in the storyline rather than reading the play simply from beginning to end. I thought it was a very clever way of teaching the subject, but are there some of your parents who think that is a bit irrelevant and they should be doing a bit more of the engineering?

Jim Wade: Georgia made a good point. One of the things we sell is about communication. If you are going to be a good engineer, unless you can sell your idea in an effective way, whether it is at a board meeting or to your colleagues, no one will take up your idea. The communication side is very important to anybody who wants to be a future engineer, as is being able to speak a modern language and perhaps being able to communicate that idea to somebody on the other side of the world. We try to sell that quite rigorously to our students because we do see that, in terms of their long-term benefit and success, they need those skills.

Q94Stephen Metcalfe: We would all like to see an engineering specialist teacher in every school, but I doubt that is practical. How can we give teachers in schools an enthusiasm for engineering so that they appreciate its value and promote it?

Liz Allen: I wish I knew, but by far one of the strongest features of Newstead-probably Jim would say the same-is the support people. I don't want to call them "nonteaching" because that sounds as if it is a non-something. They are highly skilled and extraordinarily able people. For our level three engineering diploma delivery we use a technician who delivers most of that programme, because he is just better at it than the teacher-trained person. So they are strong skills.

Q95Stephen Metcalfe: Is he an engineering specialist?

Liz Allen: Yes.

Maggie Galliers: Colleges have a long tradition in offering engineering. If I might offer a few green shoots, our preliminary survey this year shows that over half of colleges are seeing an upsurge in interest in engineering courses. I very much hope that when we get the final figures that will be confirmed. Of course we use specialist staff and engineers. Some of them we have to train to teach, but we start with the people who really know their subject. There is a way through this. You are right that it is not feasible for every school to have either the resource to create the engineering environment that would be needed or the technical experts, but there is an opportunity here to use colleges as a resource for this. Of the UTCs in existence so far, 26 of the 33 have a college as a lead or support sponsor. My own college has worked very hard with local schools to offer the principal learning of engineering as part of the diploma. Schoolchildren would come to us for part of the week and do that principal learning and some of the rest of the subjects in the schools.

We have an opportunity to rethink at 14 what the educational landscape looks like. It would be unrealistic to think that we could have a UTC in every neighbourhood, wonderful as they are, but we certainly have colleges in every neighbourhood. The more we can do at 14 either to enrol students directly or work in collaboration with local schools to co-create some of the inspiring examples we were talking about earlier, the more it would benefit everyone.

Liz Allen: You are absolutely right. Georgie mentioned that a large proportion of her principal learning for the engineering diploma level two was delivered at Bromley College, the local FE college. That is a very fruitful partnership, and other things have come from it. I think that collaboration is the key.

Jim Wade: I understand that our position is slightly special, but our partner organisations, like National Grid, Network Rail, as well as the companies mentioned earlier, design the curriculum projects that the youngsters work through. The people from those business

organisations help us deliver those to the young people. They run sessions with young people and young people go on visits to those organisations. Those business organisations own those projects at the academy and feel quite passionate about their delivery. On some aspects-perhaps it is a Network Rail problem that youngsters have been set on switches and crossings-my staff, even though a lot of them are engineers and nearly all our maths and science teachers are engineers, don't understand the details of that. So the experts come in from those companies and deliver those sessions to the young people. We get a huge amount of feedback from our youngsters that they love the input from the people coming in who are the real engineers, because it feels really real because of the way they talk to the young people. That is a real growing opportunity to have those meaningful projects in which those businesses are engaged. Earlier you asked the students about people coming in. They have to have something to do and own when they come in to make the experience for the young people and the business partners a very effective and inspiring one.

Q96Chair: In the college sector over the last five to eight years or thereabouts there has been a discernible shift in the way colleges engage with employers and create courses that are relevant to the needs of local industry in the way that Mr Wade has described at his school. Was that a thought-out strategy, or did it happen by accident?

Maggie Galliers: I think Government can take some credit for it. We have been incentivised to think about how we might not only be more responsive to industry but sometimes take the lead. If we take my own college as an example, we work with 2,000 employers every year. We are upskilling in the workplace; we are co-creating foundation degrees, higher apprenticeship frameworks and so on. We have those ready-made industry contacts. In my own engineering department, because we offer provision at level two, which contains both underpinning knowledge but also practical skills, some SMEs in particular will be more interested in taking an apprentice who has done a year or so with us, and gained some of those skills and can be useful from day one. They will ring us up and say, "Have you got a good one?" We will be able to set those young people on the path to apprenticeship with that combination of practical and academic skills that they need. Yes, it has been a thought-through strategy, colleges have stepped up to the mark, and we have a lot to bring to this agenda that we need to tap into for the benefit of all young people, whether they are in schools or colleges.

Q97Stephen Metcalfe: Liz, how much external contact do you have with businesses or other organisations to help promote engineering within the school, excluding college input?

Liz Allen: We do have a lot; we generate a lot. I am a trustee of the Engineering Development Trust, which is important; it keeps me tapped into what is available, but we do drive that hard. The school is active in promoting it. Georgie mentioned our director of careers educational guidance. He taps into parent power and to connect through parents, and our best route to get industry links is through our parents. As Jim has said, you get these great crusading companies that are the bedrock of what you do.

Q98Stephen Metcalfe: You do, and I have seen examples in my own constituency, but it strikes me that it is a scatter gun.

Liz Allen: It is.

Q99Stephen Metcalfe: We as a committee always get the best and brightest; the schools that are doing the very best; we get the best examples and we get the best students in front of us. My concern is how we scale that up to cover the whole country so that it is not scattergun and does not need an inspiring leader or just to be lucky and be in the right place, but it forms part of the curriculum. There is some external input and the curriculum is not so tight and packed that there isn't room for all these wonderful experiences that can inspire generations to go on to be engineers, or anything else that might take their fancy. We have to make some space and scale it up.

Liz Allen: We were two thirds of the way there with the engineering diploma. I am sorry to bang on about it, but we were. I understand the Government's approach to diplomas. Because of the 14, I would speak like this only about the engineering diploma. But it did all of that. It required employer engagement and students to apply their learning, and it required collaboration with FE and other educational institutions. They are essential elements of the engineering diploma. It is there, but, as Georgia quite rightly said, because of that amount of scope, its talent has been too greatly reduced. I am sure that courses like that are the vehicle because it is in the specification that you have employer engagement; it is there in the programme.

Maggie Galliers: My understanding is that the Chancellor made an announcement recently that there would be a good hard look at the principal learning in engineering. It may well have the potential to become four GCSEs again. We would very much welcome that. To make a more general comment in relation to your question, it is my belief that curriculum qualifications and performance league tables need to be thought of in the round. At the moment we have some elements of silo thinking. What has been thought about perhaps in terms of qualification reform, performance league tables and so on is not necessarily joined up with curriculum and has the danger of creating some perverse incentives in the system. Some of the questions you were asking about how EBCs might impact on this are the right ones.

Stephen Metcalfe: I might come back to that in a minute.

Chair: You might be inviting us to suggest that the Secretary of State ought to do the engineering diploma, but we will pass on that one.

Q100Pamela Nash: You heard my questions to the last panel about careers advice and what their experience was. Could you share with us your general view about careers advice in the UK? One of the quotes here from the written evidence is that it is virtually nonexistent. Could I also ask about your particular experience as head teachers and principals of careers advice for students in your schools?

Jim Wade: This is going to sound terrible, but I will make a general comment and then say that obviously we don't do that at the JCB Academy. Generally, youngsters' access is poor in terms of both the amount of support they get and the inputs. We are in a slightly privileged position because youngsters have chosen to come to us at 14 with a particular aspect in mind and they work with a lot of our business partners over that period. We also employ a full-time careers education and guidance support worker. She comes from an apprenticeship background, which provides our youngsters with that detailed knowledge. She also provides careers lessons for the students, and it gives youngsters that opening up.

I was really interested in what the students said because they all talked about the impact of work experience on their career thinking, and I would agree with that. Even if it is not the most fantastic experience you ever have in your life, for a lot of youngsters that opportunity to go out into the workplace and talk to the employers they are with during that week informs their own career thinking.

Maggie Galliers: Clearly we work with students across a broad spectrum of backgrounds, so not all of our students will have the good fortune to have parents who are interested and able to advise them well. They depend heavily on the advice that they get from schools. With the demise of the Connexions Service, a duty has been placed on schools now to offer independent advice and guidance, but few schools have the resources to do all that that job requires. There are, I am afraid, perverse incentives in the system to advise young people that to stay on in my school sixth form is the right answer. You can absolutely understand why people think that, particularly when they are passionate about the quality of what they do post-16, but it means that we as colleges are finding it increasingly difficult to get into schools and even start thinking about some of the alternatives that might be available. We need to go further and follow the good example of schools like Jim's to see how we can qualify people within schools to a Kitemark standard to offer truly impartial advice and guidance and also put a duty on them to ensure that colleges, apprenticeships and other post-16 options are laid out before young people.

Liz Allen: The Connexions Service never served the students in Newstead because children were traffic-lighted. Newstead students always came up green because it is a selective school, so they never got their entitlement to careers advice and guidance through the Connexions Service. You can appreciate that that horrified me and so we have always had internally a careers department. I have a director of careers education and guidance, with a full-time assistant and a careers resource within the school. He is qualified in careers education and guidance and is impartial, and I take your point that it is critically important that students have access to independent and impartial advice.

At Newstead we have considerable churn between years 11 and 12. A number of students move on to more appropriate courses and a number come in to access the engineering diploma at Newstead and the IB, which isn't available elsewhere. That is crucial. But it is not just advice on careers; it is a full programme from year 7 all the way through about understanding your skills and abilities, having an opportunity to see what is available and being engaged in that with as many opportunities as possible. We run a biennial careers convention, for example, so that students can see what opportunities are available for them and encourage them. At that careers convention there are gap year pupils, industry people, other routes such as apprenticeships and so forth available. We do all of that.

But more needs to be done than that in encouraging students to have those opportunities to experience what the world of work is like generically-because schools are rarefied places, not real places-and to have that generic experience in the working environment. We encourage them to work in local primary schools, run community activities and so forth just to get out. There are two work experiences in years 10 and 12. In year 12 it is more work shadowing. What does it feel like to be in this profession or role? I don't know how Georgie feels about it, but I think that work shadowing experience of just walking in somebody's shoes for some time is immensely valuable.

Jim Wade: Maggie made a point about perverse incentives. I am sure these are unintended consequences, but a really good example of that are league tables. We are now measured on our destinations. If you take my school, last year, of the year 13 students, 50% chose to go into higher apprenticeships. Most of those students had offers at universities, and a significant number had offers at Russell Group universities but have chosen instead higher apprenticeships with organisations like Rolls-Royce, Bentley or JCB itself. In the league tables we will now get a low score of the percentage of students going to university because they won't count. That is appropriate; that was what those youngsters wanted to do. Rather than study engineering at Sheffield or Southampton, they chose to do a higher apprenticeship. As to the point Maggie made, potentially there is a perverse incentive for me to sit down with those students and say, "Oh no, you don't want to do a higher apprenticeship; actually you want to be doing that," because that would look better for us.

Q101Chair: So all of these are higher apprenticeships that can lead to a degree.

Jim Wade: Currently, they will not count in the league tables.

Q102Chair: So, on day one of a student going to university, it counts even though that student hasn't even started studying, but on day one of somebody starting a higher apprenticeship, which can lead to exactly the same qualification and they can be paid while doing it, it doesn't count.

Jim Wade: Correct.

Q103Chair: That sounds a bit perverse.

Jim Wade: I wouldn't disagree with that statement.

Maggie Galliers: We could also add that the points score for vocational qualifications in the league tables at key stage 5 has been downgraded this year. It will appear that the value added is less than it has been in the past, but the value added is exactly the same.

Q104Pamela Nash: From the information you have given me I would take it that inschool careers advice throughout school, if it was supported, is what would be preferred, but later on it might be better to seek independent advice. But obviously your students have only been able to access the system we have had in the past. How can we fix the situation that we have at the moment? Is it something that has to be co-ordinated by national Government? Is it something that local authorities and schools are adequate to sort out themselves?

Liz Allen: There are resourcing implications, as there always are. It is the timing that is unfortunate. At a time at which careers advice and guidance is being delegated to schools, our funding is being cut by 1.5%, or 3% in the sixth form. If you are in my position-I don't know if it's the same for you, Jim-having to trim about £60,000 a year from the school budget, at the same time as having to create discrete careers advice and guidance in the school, is a tricky one to manage. It is the coincidence of those things. I accept that both are absolutely necessary, but I have to be extraordinarily creative in making it work.

Maggie Galliers: One of the things that we have done in Leicester is to offer NVQ training in impartial advice and guidance to existing schoolteachers. They come in their own time and we go out to visit them to try to help with this, but you can't get away from the fact that a

school will have its own environment foremost in its mind and you need somebody who can scan the whole horizon for opportunities.

Jim Wade: It is quite a difficult one, which I suppose is why you have asked the question. In essence, in terms of delegating the responsibility to the school, there is some sense in that in so far as the Connexions provision was always very patchy, because the resource that was ever put into it was very small, whereas youngsters are at the school, in my case, for 40 hours a week; I know that is slightly unusual. Therefore, the school is in a good position to give them guidance. They have tutorials, mentors and that kind of thing within the school. Going back to the point Maggie made, the question is how you can make sure that is impartial and that youngsters get the kind of advice that enables them to move on to the right programmes of study.

We talk about budgets and all the rest of it. I said jokingly to our careers adviser that I thought she was a bit too successful last year because she got nearly a third of our 16-year-olds on apprenticeship programmes so they didn't come into the sixth form. That is the type of tension that exists probably within any school environment. I don't necessarily disagree with delegating that responsibility to schools, but there is a real tension in trying to make that independent advice and guidance to make sure youngsters go the right way.

Q105Chair: It must be predicated on the teachers having the right continuing professional development; otherwise they won't know about the jobs that are out there.

Jim Wade: Yes. It is such a big task given the number of courses that colleges have on offer, the apprenticeships provision and so on and the right things that youngsters need to do. It is a very professional role.

Liz Allen: The director of careers education and guidance at Newstead is a non-teaching role. It is just impossible to be both a teacher and a careers guide because you need to be expert, and you need to have that opportunity, as Maggie said, to do the training but also to keep in touch and network.

Q106Pamela Nash: That is a very important point. We heard from Kirsty earlier about the great work she is doing in going into schools and inspiring young people to follow in her footsteps. Last week I visited SELEX Galileo in Edinburgh and heard from their apprentices who were doing similar work as well. In your experience, what role do companies have in educating young people about potential careers in engineering? Is there anything else they could be doing other than supporting their apprentices to go into schools?

Liz Allen: By far the best work that engineering employers need to do is supporting things like the Engineering Education Scheme and providing mentoring teams to students on schemes like that where there is an in-depth relationship on a project in mentoring. This is where there are real projects and they are working together. The ambassadorial role of going in and talking is important, but being part of the same team and working on real stuff is what inspires students, rather than forever building bridges out of straws. That is hugely successful in primary schools, so it is that engagement in the learning process.

Maggie Galliers: I would endorse that. Some of the big companies are especially good at doing that. In Leicester, we live in an area where we have a lot of small and medium-sized enterprises. We have to be realistic about how much we can ask of companies. We have got

to supplement that with targeted campaigns. I am aware that in Macclesfield, for example, at the moment there is a "Girls Can Do It Too" project specifically linked to engineering. We need to draw together the resources of the schools, colleges and industry to come up with some creative ways in which we can do some of the very important things that Liz has been talking about.

Liz Allen: A fellow engineering specialist school in Chelmer Valley has near to it an engineer who works on his own in a garage making very fine medical instruments for operation procedures. He says the same thing. "If I come into school, that's a day's work gone," but he allows students in the school to go and sit in his garage. They are mesmerised and inspired by this man. They just need the experience. What small and medium-sized companies can do is allow students to do that shadowing. "Can we sit here and watch what you do?" is as valuable.

Jim Wade: In terms of business development, our whole curriculum is predicated on it being designed by our engineering business partners. We have found that they are absolutely passionate about what they do, and the engineers, to be perfectly honest, are really keen to come in and do the work. Looking back on my experience of what I've done before, too often we have asked businesses to come in and do a little bit here or there, give a lecture here or there or make a particular input. We very rarely say to them, "We want you to own part of the curriculum. We want you to co-construct the curriculum alongside us and be part of that." That is the bit that, often, really inspires them, when they feel that real ownership of it as well as engaging with the young people.

Q107Stephen Mosley: We have had some very positive feedback from the engineering community about university technology colleges. Mr Wade, as the principal of one of the five, what do you think are the key benefits of UTCs?

Jim Wade: In terms of what we provide for our young people, the first thing is having the opportunity to construct a curriculum that is a holistic experience for the young people, taking our engineering themes and using those as some of the vehicles for delivering some of the rest of the core subjects.

The other thing is that, because it is all in one place and a big investment has gone into our schools, we have been able to coalesce industry involvement in that and create a real buzz in terms of what happens there and the people involved in it. Because we are so specialist, it enables that to happen.

Finally, we set ourselves up almost to be a shining beacon and something you should aspire to. Somebody said you couldn't have one in every community. Maybe you can to a certain extent, but you could have a shining beacon that engineering is something you should look to do. Last year we were over-subscribed almost two to one in terms of our places, and hopefully even more will subscribe this year. That means a lot of youngsters don't get in, but we are quite encouraged that a lot of youngsters are inspired to think that engineering should be 40% of their week at ages 14 to 16. Maybe it generates a little spark in them to think about what they might do back at their school and maybe that is what they will do at a college, sixth form or something like that in the future.

Q108Stephen Mosley: Can I ask Liz Allen and Maggie Galliers for their thoughts on UTCs?

Jim Wade: Shall I leave the room?

Liz Allen: No. I agree with everything Jim said. If I had another headship in me, that is where I would be going.

Maggie Galliers: I reiterate what I said earlier. UTCs are beacons in their communities. Colleges have been very glad both to sponsor and collaborate with UTCs, but we have to accept that engineering is a very resource-intensive aspect of curriculum. We need to offer value for money, and we have some ready-made resources in colleges. The more we can do to open those up, either by direct enrolment at 14 or collaboration thereafter, it could help to open up the world for people.

Q109Stephen Mosley: We have had some concerns that the focus on UTCs might lead to less focus on engineering in other schools. Is that a fair issue?

Liz Allen: I would hope the Government wouldn't say, "We've got a few of them, so we've sorted that." I don't think they have that kind of approach. I do think they could make more use of the group of specialist engineering schools-the remainder of the Specialist Schools and Academies Trust. I think there are 64 or 65 of us, and we are well distributed across the country. Our philosophy is very similar to the UTCs. We use the engineering specialism as the core of the curriculum, but it is an inspiration across the whole curriculum. It is not resourced in quite the same way as the UTCs but the philosophy is the same. It would be a shame if that group of engineering specialist schools literally faded away into oblivion because the discrete funding is no longer there.

Maggie Galliers: You might be interested to know that we are working on a project with the Royal Academy of Engineering to create some new materials and staff training opportunities called "My Science", which we hope will help to alleviate that problem.

Jim Wade: It will be interesting to see what the competition does over a longer period of time. Youngsters have to leave their school at the end of year 9 and come to my school at 14. I can't tell you that my colleague head teachers are always entirely happy about that. You might argue that, if they don't want those youngsters to come to me, one way of resolving it would be to say, "We've got an engineering provision here. Don't go to the JCB Academy." We might almost be the spur for other people to compete with us perhaps.

Q110Stephen Mosley: There were quite a few "mights" and "depends" in all three answers. Are we seeing any reduction in engineering in other schools because of this? I guess that locally to your school we might be, but we have only got five at the moment and they are mainly concentrated in the West Midlands. In terms of specialist engineering schools across the country, are they seeing any negative effects from this at all?

Liz Allen: I can speak only for Newstead and we are not. I don't think there is any concern among engineering specialist schools about the UTCs, because philosophically we are at one and there isn't an issue there at all. We have UTCs and a couple of engineering academies opening up in the Greater London area, but they are not impacting Newstead because it has its reputation for engineering.

Jim Wade: I know that there are very few schools choosing to offer the diploma now, given that that has been reduced in its numbers. Because of the push on the English baccalaureate

and the expense of offering engineering as a course, most schools are making the fairly logical decision not to offer that to youngsters at 14. Yes, there is a significant reduction in the amount of engineering available to youngsters aged 14 to 16.

Q111Stephen Mosley: You are going to be able to talk about the diploma in a minute. I know Georgie will probably be pleased because it is one of the issues that she asked us to question you about. In terms of opening more UTCs, I know the plan is to open 34. The Baker Dearing Educational Trust suggested that the Government should set the target of at least 100 before the next general election. Do you think that the Government should commit to opening more? Do you think the programme should be speeded up or slowed down?

Jim Wade: With all these initiatives, the key is to make sure that the quality is there for the young people. I was head of my previous school for eight and a half years. When we set up the JCB Academy, one of the things I was conscious of was that day one, when the students walked through the door, had to be a fantastic and high-quality experience. We can't learn on the job. Those youngsters are choosing us at the start of their GCSEs and they have got only one shot at that. Therefore, we had to get that right from the day those students walked in, in 2010.

The only caveat I have about UTCs is that, like any Government policy, it can't be that the target is to open this number by this date, because it is about making sure that the quality of the experience for those young people is fantastic when they walk through. If you set a target of having this number by this date, the danger is that you run for the target rather than ensure you have the quality. I think 100 is a reasonable number, but my caveat would be that it is about making sure that the quality for the young people from day one is there.

Another small caveat is that we had 20 months. I was in place from January 2009, and we opened in September 2010. That is not the funding they are getting to set up UTCs at the present moment. Clearly, that makes it much more of a challenge to make sure that when you open on day one there is that quality for students.

Liz Allen: I would build on what is already there. There are over 60 engineering specialist schools, philosophically inclined, which are heading in the right direction and want to continue. That would be a really good place to start looking to see whether there is a future in developing the UTC concept within those schools.

Maggie Galliers: Colleges could be a resource for this. If I may build on the "target" point, at the moment we are seeing some radical change to the educational landscape and an atomisation, if you like, in some senses with academies, studio schools, UTCs and so on. We have to understand that, where new provision is put on an area, the demography remains the demography. If students go to the new school on the corner and don't go to the old school, that causes surplus places in other schools. That is something that has to be managed through.

Q112Chair: Mr Wade, following on from that, you have a fair amount of very hands-on support and interest in the creation of the school, not just through your industrial sponsors but the Minister himself, Lord Adonis, on a hands-on basis. It is not realistic to expect that in the roll-out of others, is it, or is it necessary?

Jim Wade: There are two necessary bits. The first is real involvement of the business community. I think that is absolutely crucial. The other bit that is crucial is the right kind of

time frame. The early political support of the JCB Academy was critical because it was the first. If it hadn't had that support coming through, it would have been very difficult for us to have gone through the Department for Education's processes over that period of time. Clearly, there is a unit now within the Department for Education that is focused on free schools and UTCs. That process exists now, whereas it didn't perhaps five or six years ago.

Q113Jim Dowd: As Stephen mentioned, can we move on to engineering diplomas? I know you have made more than one reference to it so far, but perhaps we could pull it all together. Would I be incorrect in assuming that you are less than enamoured with the changes that have taken place in the diploma in the recent past and what effect do you think it has had on teachers, parents and the students themselves?

Jim Wade: If you look at the work that youngsters do at our place, I have to spend about 14 hours a week on the technical block. The vast majority of that technical block is the diploma, for which they get only one GCSE in terms of the league table. It is the core of what we do, so we are not going to stop doing it. Probably, for us, it also doesn't make a huge difference in terms of who chooses to come to us. The young people at the school do feel that engineering has been downgraded. You can argue whatever you want in those terms, but that is how they feel about it. They feel that the qualification they now do has less worth than it had before. It is the same qualification; it is the same things youngsters do, but that is how they feel about it.

Q114Jim Dowd: Is the content still the same?

Jim Wade: The content is still exactly the same. From what George Osborne said last Friday, it might be replaced, but there is no guarantee that it will be here beyond a couple of years, so there are concerns from parents. We will carry on doing it, but hardly any other schools will do so unless they are very specific and passionate, like Liz's school.

The other issue for us is that, for the advanced diploma, there haven't been any changes to level three, but the concern that we have had from parents is about doing the level three diploma because it's the engineering diploma. They have changed the key stage 4 diploma, so are they going to change what happens to the level three qualification? We have had huge amounts of concerns about that from parents. Therefore, for our students currently at our academy that is not too difficult a sell for us, but for students outside that is very difficult.

An unintended consequence of what has happened at key stage 4 is having a big impact post-16 as well. I just think it's a real shame. I am on camera and I can say this. One of the things we said to Government was, "Why not make one exception?" Yes, we knew; everybody knew. There were loads and loads of qualifications out there that didn't have a huge amount of value, but why not look like you are really supporting industry? Why not look at rebalancing the economy just by making one single exception? How fantastic you would have looked if you had done that. Anybody you speak to, whether it is industry, FE, HE or schools, is saying that we had a qualification of value that pretty much is going to disappear, and I think that's a shame.

Maggie Galliers: I think there are two strands here. One is the amount of teaching time that the diploma takes. My understanding is that it is about 40% of the teaching time, but the Wolf recommendations are that no more than 20% of teaching time should be spent on vocational qualifications, so there is a tension there. There is certainly a tension in terms of the league

table issue. While I support Jim in terms of the engineering diploma having the proper worth within those league tables, I would argue that there might be more than one exception, but that is not to say that we ought to overvalue things that don't deserve it.

Liz Allen: I get very angry when the engineering diploma is described as a vocational course; it just is not. Georgia spoke well about the importance of communication, and in this we need to get our vocabulary absolutely right. I have a vocation to be a head teacher. I have vocational qualifications, which are two degrees and a teaching certificate. We take the phrase "vocational qualification" to mean what you do if you are not bright enough to do an academic course.

In your terms of reference you ask whether we need academic or vocational courses. No; we need applied learning courses. That's what we need. We need courses that are high impact in terms of knowledge and understanding that then require the application of that in a real environment to improve things, as Kirsty said. That is what the engineering diploma is. The Government can make an exception because it's an exceptional programme. It doesn't fit into an academic or vocational niche. Like Jim, I hope they have the confidence to make an exception, however they do that. They might need to rebrand it-that might be the process we are in-as long as the rebranding keeps employer confidence, which the engineering diploma certainly has. That employer engagement is crucial. I hope we move from thinking of qualifications as being either academic or vocational, because neither term means anything.

Q115Jim Dowd: We heard from the previous panel of students how much value they placed on the diploma as participants. Mr Wade, as I understand it, you are saying that your numbers remain the same because that is the backbone of the establishment. What about you, Ms Allen?

Liz Allen: We are just going through our progression for year 9 students to see what they are going to do at key stage 4. I think the level two engineering diploma numbers will hold up for all the reasons that Georgie said. All students are required to do a DT subject, so they will choose it as that subject. I am concerned about it because it requires a considerable amount of additional time commitment. Our college programme is in twilight time-after-school time-and students commit to do that additional time. I am concerned about that. However, students are doing the course because they value it.

I agree with Jim that there are real issues about level three engineering. We need an effective strategy to continue to promote that because it is so valuable. I think HE has a role in that. Students and staff have this view now that what they feel is a highly regarded course has been nationally devalued, and employers feel very much the same way about it. That is a shame. I hope we can put in some kind of rescue plan to make sure that we don't lose the value.

Q116Jim Dowd: That is the very next point I want to come to. Is the feeling that it is not just the qualification that is devalued but it is more revealing of the Government's attitude towards engineering and associated subjects?

Jim Wade: Yes. I don't know whether we will go on to the EBacc.

Q117Jim Dowd: That is the next lot of questions.

Jim Wade: I am sorry; we keep jumping ahead. What has value is what is measured. As a society we tend to give value to what somebody is measuring and putting in a table and publicising, whether it is GDP figures or whatever else it might be. Because there are no technical subjects within that, it sends a very stark message to those young people and their parents who may be considering technical education as a route. You then link that to what has happened to the engineering diploma. Intentionally or not-I don't believe it is necessarily intentional-that is the clear message I pick up from talking to parents, students and so on. They are passionate about what their sons and daughters are doing, but there is a feeling that the outside world is "agin" them in some way. Given that we are talking about rebranding it and rebalancing the economy-all those kinds of things-that can't be the message that we want to send out, but I think it is the message we have sent out.

Q118Jim Dowd: There are only 20 out of 650 Members of Parliament who have a STEM background anyway. The bias is very much elsewhere. Ms Allen, you said you hoped the matter could be saved or resolved. If you were able to, how would you go about doing that?

Liz Allen: I know that the advisory group of the Royal Academy of Engineering is just beginning to talk about that. If we take the science approach at key stage 4, although there are chunks of content, there is a notion of a single additional and triple structure to science. Perhaps we can look at engineering in a similar way. My anxiety in saying that is that I don't think the engineering diploma can be chopped into three bits, but to have a similar approach might be a route out of the current situation where it is single accreditation. It might be a way of showing a kind of accrual process and give a narrative that would allow the engineering diploma to have its true value.

Jim Wade: It is really difficult. The trouble is that the new structure for GCSEs, particularly if they are going to be EBC GCSEs, will be linear assessment at the end of two years. However you chopped up the diploma, if you made it fit that process, you would end up with a qualification that wouldn't be engineering; it would be a theoretical study where the youngsters at the end of two years would regurgitate some knowledge in an exam hall. That wouldn't give you that mix of practical and theoretical learning that you are using to solve problems, which gives you the employability skills to make those steps in terms of your life. Therefore, there is a danger that we take what is great about the engineering diploma and try and get it to fit what will be the new structures for assessment and compliance in relation to GCSEs. I have a worry to a certain extent. We have already made the decision at our governing body that, if that is the route it does go down, we will stick where we are. Even if it gets no league table points, we think that what we do is so good at this moment.

Q119Jim Dowd: Even though it is less popular with students outside a specialist establishment like your own.

Jim Wade: I think it wouldn't be done by students outside an organisation like our own, because it is our mission, it is our passion. We will stick with what we believe. Our mission statement is about developing employability skills in young people. We have a list of employability skills that we look to deliver. If you look at the centre skills framework in terms of employability skills, the diploma is a really good vehicle for delivering that set of core competencies. That is why, for us, it sits behind the rest of it. My concern is that, if we replace the engineering diploma with some kind of GCSE engineering-type structure, that won't be fit for purpose. If you look back at the other engineering qualifications, like the applied GCSE in engineering, again, it wasn't a particularly popular or successful

qualification. I know the Royal Academy is involved in the development and that might help, but I do have some real concerns about that.

Liz Allen: I am a little more hopeful than Jim that the current view that everything will be linear at GCSE will have to be modified. I have geographers, musicians and arts and drama teachers saying this is a nonsense. I have a feeling we will come to a reasonable view on where engineering can sit.

Jim Dowd: Governments being reasonable! Whatever next?

Q120Stephen Metcalfe: I want to pick up a little bit more about the EBacc and your wider views, first, on its aims and, secondly, the impact it will have on a wider range of subjects outside the core five subjects. Are you concerned that schools will focus on doing well in the league tables for the EBacc at the expense of everything else?

Liz Allen: You are presented with two-dare I say it?-confident school leaders who have experience enough and commitment enough to say we will do what is right for our children. Therefore, I doubt if Jim, and certainly Newstead, have made any alteration to their curriculum at all since the EBacc announcement. I am just not interested because it doesn't fit with our philosophy of what a whole learning programme is at key stage 4.

However, there are schools whose reputations may be more fragile and whose leaders are less confident. I have a colleague who works in a school that has already completely redesigned its key stage 4 programme and increased the amount of time in the curriculum for English, maths and science at the expense of languages and the arts. It is absolutely dire that that should happen, and I am sure it isn't the Government's intention. I am concerned that we do not have sufficient confident schools to do what is best for their children, and that is a huge concern.

Maggie Galliers: League tables are a key driver for many heads, particularly those that are in fragile circumstances or very competitive environments. One of my association's concerns about the EBacc is that although such a set of curricula might be very suitable for many students and you would hope that standards would get driven up through a vehicle like that, there will, we think, be quite a high percentage of students for whom that kind of learning may not be the most appropriate route. Learners that we often pick up at 16, who have not been able to successfully achieve at GCSE, achieve very successfully when they are put in a technical and applied environment. If the EBacc is to be for 100%, it means that some will sift through. We are not sure how much currency a statement of achievement would have, nor how the experience of perhaps failing will impact on willingness to stay on at school and in options post-16. It will have consequences, but it is difficult to predict exactly what they will be.

Jim Wade: One thing recent history shows us is that if you wish to manipulate the education system, there are two main levers. One is league tables and the other is to give them a little bit of money. They will leap through all kinds of things for little bits of money and also for league tables. Those levers have been very effective in changing schools' behaviour. There is no question that it has changed schools' behaviour.

My real concern is the message that it sends out to young people about what is important and what has value. My other concern is my own experience. Both of my children are at

university and they chose to do A-levels in the things in which they had success at GCSE. If all the brighter students at a school are encouraged to do all the EBacc subjects, there will be things they won't be taking as a result. The likelihood is that more of those youngsters will go on to take A-levels and advanced study within those subjects.

In talking to all our partner organisations, it is clear to me that, if you look at the technical skills gap in engineering, it is those very people that we need to be filling those technical skills jobs; it's not the youngsters who can't get the EBacc. Looking at the incentive that now exists within the system, if you are running a school and you are likely at any point to be under threat from Ofsted, or there is pressure from other schools in terms of league tables, you will do your damnedest if you are head teacher of that school to ensure that every single child who could get that does so. That will warp those youngsters' choices, and it will warp post-16 choices as well in relation to those youngsters. We have a skills gap at the moment, and we will have a bigger one if you want my own view in terms of that. We always look at targets, measurement and all those kinds of things. It is often the unintended consequences, not the well-meaning decisions, that have the biggest long-term impact.

Liz Allen: I have a huge concern that, in time, it will have a dramatic effect on school communities and will impoverish them hugely. The rich life of a school is its engagement in its music, art, creative subjects, into which category I put design and engineering. If you strip those out of a young person's entitlement to curriculum, you end up with a very impoverished environment, and it is a very unwise thing. The really healthy things in a school are the great collaborative subjects and team efforts, and we would lose those at huge peril.

Q121Stephen Metcalfe: Is there a message therefore that you would like to send, since you are in this forum? Is there a change you would want to see that would combine the aims of the EBacc but with a more practical application or inclusion of some of the subjects you are talking about?

Maggie Galliers: We would advocate that it is worth considering a tech-bacc route that might be a kind of wrap-around, taking in the core subjects of English, maths and science-they would have to be core to everyone's experience-with the ability to broaden that out into other kinds of subjects that are of a more applied and technical nature.

Jim Wade: From a personal point of view, we know that English, maths and science are at the core of what we do. There would also be a strong push in having a practical dimension to that-having some kind of extended project dimension in terms of what you are doing. If I go much further, I am going to describe the Tomlinson diploma, which was suggested quite some time ago. If you want rigour and to have young people with an entitlement that is both broad and rich, that strikes me as a much more effective route to go down.

Q122Pamela Nash: We covered work experience quite extensively earlier. Mr Wade, in the written evidence submitted by your school you mentioned that some of the schools in your local area will not be offering work experience next year. Can you tell us more about that, and why that is the case?

Jim Wade: Since the requirement to do it has been removed, in my area various schools have made the decision not to offer work experience. Apart from a small minority, the bulk of students will not be doing work experience. It has made our lives a lot easier; it is much easier to get placements than it was when we were competing against everybody else, but

there are several pressures pushing schools down that route. There is pressure from the league table pressure, because obviously you are out of school doing work experience. There is an organisational and cost issue in that we pay for the health and safety checks at the moment. My school pays about £5,000 to an outside company to do those health and safety checks.

Q123Pamela Nash: Annually for all students.

Jim Wade: Yes. All our students do one week every year, so if you are with us for four years you do four weeks.

Q124Pamela Nash: But the cost in terms of checks would be £5,000 per student.

Jim Wade: No, per annum. We pay an outside organisation that goes round and does it. It was the old Connexions service, but it is a part of that. You have financial pressures, which Liz mentioned earlier on; you have league table pressures and organisational issues. To do work experience is a difficult, time-consuming and costly thing for a school. Therefore, some schools will make the decision that, if youngsters want to do it, perhaps it is up to their parents to do it in the holidays, but it is not an entitlement.

Q125Pamela Nash: That is particularly worrying to me. I never heard anyone argue against work experience being something worthwhile for a young person.

Jim Wade: It was argued against in the Wolf report, which I presume is where the change in Government policy has come from.

Q126Pamela Nash: Do you think this change in policy has been a mistake?

Jim Wade: I think it has been an error. If all schools are on a level playing field, nobody has to go and do work experience, but if the school down the road from you has their youngsters in school for an extra two weeks maybe that is going to make a bit of difference, including the points made earlier about EBacc and all the rest of it. If your budget is being cut by 1.5%, and 3% for the sixth form, per year, and you have to find money for that as a potential service, you can see why some schools, now they don't have to do it, are making that decision. Don't listen to us, but the three young people before you earlier talked about their work experience as being fundamental to their career decisions. Therefore, if that is something that lots of youngsters cease to do, we will have even more youngsters who make inappropriate decisions. They will go to university courses or post-16 courses and find they are doing the wrong thing, and that is a huge waste of the young person's time and the country's resource.

Maggie Galliers: I couldn't agree more. The sort of person who is going to be inspired by engineering needs to get some practical hands-on experience, whether it is in a work placement or perhaps in a realistic working environment like a college, but I would endorse that it is not just some but many schools who are cutting back now on work placements. That is certainly the experience in my area.

Liz Allen: I would agree. It is something we hold dear. What are we educating young people for if it isn't preparing them for the workplace? It would be utterly ridiculous if they didn't have that experience as part of their learning package, but I say that as a school that is confident and philosophically inclined to do it. Many schools don't have that privilege.

Q127Pamela Nash: You mentioned that a third of your students last year went into apprenticeships rather than A-levels. How popular are apprenticeships in your school?

Liz Allen: Not at all. There are very conservative attitudes to progression.

Q128Pamela Nash: Is that something you seek to change?

Liz Allen: Absolutely. There are now more opportunities because particularly the bigger employers are giving much more flexible and creative routes into industry and business. We would rather have students at 18 than postgraduates; we would rather take them through their own programmes. Particularly with the introduction of university fees, sandwich courses-a flexible learning year in industry, and these sorts of things-and programmes like those of National Grid are becoming much more attractive, and students are looking much more creatively at their options. But it is slow to happen because, as I said, it is socially a very conservative area. Parents expect girls, in particular, to go through the traditional routes, but it is breaking down.

Q129Pamela Nash: You said a third went into apprenticeships. Is that a marked rise in recent years? Do you think tertiary fees have been part of that as well as your excellent careers guidance?

Jim Wade: We started in 2010, so that is our first cohort through. Because we have such a high degree of employer involvement, our youngsters have been very aware of what is out there in terms of apprenticeships. A lot of our youngsters come to us because they want to go into engineering; otherwise why apply and step through the door at 14? That was a route that naturally a lot of them would have been looking to go down. Therefore, there is that kind of link between us and the employers. Our careers education and guidance person comes from an apprenticeship background. She has got to know all the employers very well and therefore has guided our students, when an apprenticeship comes up on the website, to apply for it, go for the interview and encourage them in that direction.

Q130Pamela Nash: Do you think gender is an issue in your school?

Jim Wade: Yes, gender is an issue.

Maggie Galliers: Of the 220 apprentices aged 16 to 24 that we service at our college, only 18 are female, despite strenuous efforts. If we could get a pre-apprenticeship pathway going, that would be a big help to make apprenticeship more attractive to certain kinds of learners.

Jim Wade: We will be less boy-heavy next year, only because the Department for Education, after three years of pushing, has finally agreed for us to do positive discrimination. As Georgia said, we have only 10 girls in the current year 10, but 30 girls applied, and we use random allocation. We randomly selected out, as you do if you throw a dice, two thirds of the girls. We eventually persuaded the Department for Education that that was barking, so they have agreed for us to positively discriminate in favour of girls.

Q131Pamela Nash: Is that next year?

Jim Wade: That is the 2013 intake.

Chair: That is not the end of the lesson, so you can't duck out to playtime just yet. It is the beginning of the parliamentary day in the Chamber, but it is the end of our questions. May I thank you very much for what has been a fairly long session, which has been extremely informative? We hope you carry on delivering successful students for the world of engineering for a long time in the future. Thank you very much for coming.

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