OFFICIAL REPORT
AITHISG OIFIGEIL

Session 5

Education and Skills Committee

Wednesday 27 March 2019

The Scottish Parliament
Pàrlamaid na h-Alba

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CONTENTS

EDUCATION AND SKILLS COMMITTEE
11th Meeting 2019, Session 5

CONVENER

*Clare Adamson (Motherwell and Wishaw) (SNP)

DEPUTY CONVENER

*Johann Lamont (Glasgow) (Lab)

COMMITTEE MEMBERS

*Dr Alasdair Allan (Na h-Eileanan an Iar) (SNP)
*Jenny Gilruth (Mid Fife and Glenrothes) (SNP)
*Iain Gray (East Lothian) (Lab)
*Ross Greer (West Scotland) (Green)
Gordon MacDonald (Edinburgh Pentlands) (SNP)
*Rona Mackay (Strathkelvin and Bearsden) (SNP)
*Oliver Mundell (Dumfriesshire) (Con)
*Tavish Scott (Shetland Islands) (LD)
*Liz Smith (Mid Scotland and Fife) (Con)

*attended

THE FOLLOWING ALSO PARTICIPATED:

Lorna Hay
Professor Iain Hunter (University of Strathclyde)
Dr Fiona McNeill (Royal Society of Edinburgh)
Gil Paterson (Clydebank and Milngavie) (SNP) (Committee Substitute)
Toni Scullion
Liz Turner (BT Group)
Professor Ian Wall
Talat Yaqoob (Equate Scotland)

CLERK TO THE COMMITTEE

Roz Thomson

LOCATION

The Robert Burns Room (CR1)

Scottish Parliament

Education and Skills Committee

Wednesday 27 March 2019

[The Convener opened the meeting at 09:30]

Decision on Taking Business in Private

The Convener (Clare Adamson): Good morning, everyone, and a very warm welcome to the 11th meeting of the Education and Skills Committee in 2019. We have received apologies from Gordon MacDonald, and we have Gil Paterson as a substitute for Mr MacDonald. Apologies have also been received from Tavish Scott, who may join us later in the morning. Rona Mackay is coming but is running late due to traffic.

Agenda item 1 is a decision on taking business in private. Are members agreed to take agenda item 3 in private?

Members *indicated agreement.*

Science, Technology, Engineering and Mathematics Inquiry

09:30

The Convener: Agenda item 2 is a session on science, technology, engineering and mathematics to inform the remit of the committee's future inquiry on the topic. I welcome Lorna Hay, a teacher from Pitteuchar primary school; Professor Iain Hunter, research professor of molecular microbiology at the University of Strathclyde; Dr Fiona McNeill, associate professor in computing science at Heriot-Watt University, and representing the learned societies group of the Royal Society of Edinburgh; Toni Scullion, a computing science teacher from St Kentigern's academy; Liz Turner, the head of corporate responsibility at BT Group; Professor Ian Wall, a former chair of the science, technology, engineering and mathematics education committee, STEMEC; and Talat Yaqoob, the director of Equate Scotland.

I am not going to ask the committee members individually to introduce themselves, but I would like a very brief introduction from our guests and a brief outline of their interests in the area. I invite Talat Taqoob to go first.

Talat Yaqoob (Equate Scotland): Thank you very much for inviting me to speak today. Equate Scotland is the national expert on women's participation in science, technology, engineering, mathematics and the built environment. Naturally, my interest in this area is in gender inequality in classrooms, in universities and colleges, and in industry. The participation of women across STEM subjects has been at a stubbornly low level and, in some cases, is decreasing, particularly in computing science. From my perspective, the issue is not only about what we are doing to tackle societal inequality and stereotypes but about what we are doing across the education pipeline to make multiple interventions. I will focus right across those areas. Our work at Equate Scotland focuses on those aged 16 plus—from apprenticeships onwards—but we do a lot of partnership work with those who are working in schools.

Professor Iain Hunter (University of Strathclyde): Good morning. I am a professional scientist and an academic, although I have worked in industry. I am a member of the Scottish Science Advisory Council.

When all of you were elected in 2016, all of your manifestos talked about STEM—in fact, they talked about some of the issues that Talat Yaqoob has just talked about. Subsequent to that, and with

the Scottish National Party taking the lead as the Government, a framework was developed—a strategy for STEM implementation by the Scottish Government—that we will probably talk about. With the chief scientific adviser for Scotland, Professor Sheila Rowan, I co-chaired the external reference group that helped to provide advice for that. There is now an implementation group that, in essence, involves employees of the Scottish Government in delivering the strategy, and I co-chair the external advisory group that, along with Sheila Rowan, reports to the minister on that.

Professor Ian Wall: Good morning. I have chaired two committees: first, the science and engineering education advisory group and, subsequently, STEMEC, both of which wrote long and detailed reports for the Scottish Government that were fully evidenced. The STEMEC report was said to be the basis of the science strategy for learning and teaching, although a good chunk of what was in it did not really appear.

I am also a fellow of the Royal Society of Edinburgh and a member of its education committee. We recently published a revised version of our "Tapping all our Talents 2018" report, which is about the role of women in science and technology.

A key strand of the work coming out of the SEEAG and STEMEC reports is interdisciplinary learning, which—I emphasise this—is not solely a STEM issue but is about education in general and involves the humanities and every discipline you can think of. Nevertheless, the issue often arises in STEM because people get even more siloed than normal in, say, chemistry than they do in English literature, which has slightly amorphous boundaries.

On "Tapping all our Talents 2018" and the two reports, the general issue is that, although there is always new research—new ideas and so on—the question is about its implementation. "Tapping all our Talents 2018" is not a report that has gathered dust on the shelf but is one of a series of reports that is being implemented with the vigour and conviction that are required. It seems to me that a parliamentary committee is one way to test whether Governments—of any stripe—are delivering what they need to in order to deliver good science and technology education.

Interdisciplinary learning is one of the four contexts for the curriculum for excellence—it is one of the fundamental building blocks. We like to use the analogy of there being a foundation on which are built the pillars of the disciplines, and the lintels are cross-disciplinary. Only once we have the lintels in place do we have something. You can see an example of that at Stonehenge, where part of the structure is falling down but part of it is still standing. Which bits are still standing?

The ones with the lintels. It is a key area for development. We held a major conference six weeks ago, and it was one of the more successful conferences around education in Scotland because it united everybody: universities, colleges, primary schools, officers involved in the administration of education, and so on. I am hoping that it is an area to which the committee will pay particular attention in the coming period.

Lorna Hay: I am a primary school teacher in Fife, and I have a particular interest in engineering. That is where my passion lies. Last year, I did a postgraduate certificate in engineering and STEM learning. During that time, as part of my initial research, I went into industry and interviewed 33 engineers about their career inspiration and also about something called the engineering habits of mind project, which was a term derived by Professor Bill Lucas in "Thinking Like an Engineer" to talk about the characteristic ways in which engineers think and act. I have built my pedagogy around that, and we have had a big push in our school to see the importance of early intervention with engineering.

We know that the statistics say that, at the rate at which the industry is progressing, we are simply not going to have the people to fill the roles. We also know that people, particularly young females, are not choosing those options at high school—there is a lot of research on that. The ASPIRES research said that, if children are not engaged in STEM by the age of 10, they do not make those subject choices. It is my belief that, if there is to be an inquiry into STEM, we need to target primary education, because that is where we need to build the engagement. My experience, through my research, is that, by engaging children in engineering activities, we are increasing the likelihood that they will choose those subjects later.

Some research was done by Kiwana et al—"An investigation into why the United Kingdom has the lowest proportion of female engineers in the European Union: A summary of the key issues"—which found that creating an enjoyment of engineering might be as significant as attainment in the likelihood of a child choosing those subjects. That is where I am coming from in focusing on engineering. It is not something to which I had access when I was at primary school, and I think that that is where we need to focus.

There are also issues, which we might discuss, about teacher confidence or the lack thereof. How do we develop effective continuing professional development? Long-term engagement in CPD will make a difference to learners. Issues around the gender bias need to come into that as well.

Liz Turner (BT Group): Good morning. I should start by saying that I am neither a teacher nor a

scientist. I head up BT's corporate responsibility programme, and an area in which we concentrate a lot of investment activity is digital skills and general employability skills. BT employs around 7,900 people in Scotland, so we employ one in every eight people who work in the information technology and communications sector in Scotland. It is important to our business that there is a pipeline of talent coming through, but there is a wider issue for me. My area of expertise is in how we, as a business, can support education, the Government and other partners to deliver the digital skills that are needed for both the jobs and the life skills of the future. Outside the mainstream schooling system, there is also an issue around digital inclusion and how we get people who are not currently online to gain the skills and the confidence to get online.

We have been very involved in a number of programmes in schools, of which the barefoot computing programme is particularly relevant to today's discussion. As others have said, the issue is very much about engaging pupils at a young age, at primary level, recognising that these skills will be required for whatever type of work they go into in the future as well as for general life skills. We have been working with young engineers and science clubs for over 20 years, and we support the Digital Xtra Fund. Those are a couple of initiatives that we have been very involved in for a very long time.

For us, there is an issue around female engagement as well. To reiterate what others have said, we are finding that really difficult. Much as we want to get more females into engineering apprenticeships and graduate schemes, they are just not there in the volume that we need them. We would like to see that area addressed as well.

Dr Fiona McNeill (Royal Society of Edinburgh): I am representing the learned societies group, which is looking into STEM education. I am also a member of the British Computer Society, which I represent on the LSG. We meet quarterly at the RSE, and we talk about all kinds of issues relating to STEM education in Scotland. The group includes all the learned societies—the Institute of Physics, the Royal Society of Chemistry, the Royal Society of Biology, the Scottish Mathematical Council and so on. We prepare various submissions for the Government from time to time, the most recent of which was prepared last month. We did one on how subject choice at high school is impacting on the number of young people studying STEM subjects.

We can separate the things that we discuss most into two main areas. The first of those is teaching, which is a huge issue. There is a massive shortage of STEM teachers; as a computer scientist, I am really aware of that. A very large—and increasing—number of high schools in Scotland have no computing staff at all, so young people cannot take those qualifications. The problem is not just in computing; the situation is pretty bad in maths, chemistry and physics, and it is a huge issue. There is also an issue with keeping teachers in the post and even, it seems, with keeping trainee teachers on the training courses to go on to become teachers. There is a huge drop-off. We are concerned about how much STEM there is in primary schools and whether primary teachers have the right preparation and background to encourage young people in primary schools to be interested in STEM subjects. We are concerned about whether they are getting the right support in their career-long professional development to support the children in that way.

The other side of things is how we encourage young people to take STEM subjects. The number of young people who are taking STEM subjects in high school is going down. Over the past five years, we have seen the number of highers that are being taken increase overall, but the number of STEM highers that are being taken is going down. The number is going down notably in computing, but it is a problem for most of the STEM subjects. We think that the fact that young people now have fewer choices is an issue in how many of them are taking STEM subjects, as university STEM courses require multiple STEM qualifications. If a young person is taking only six national 5s, that is a problem. Of course, the gender imbalance is keeping a lot of people away from STEM subjects as well.

Outside my work with the LSG, I have done a lot of outreach work with young people and parents about how we can enthuse young people about science and engineering and make them feel that those are exciting subjects that they can see themselves engaged in. I also do a lot of work on gender issues. Along with Talat Yaqoob, I was on the tapping all our talents board, where I looked particularly at what is going on not just in schools but in the early years to steer girls away from STEM subjects and what we can do about that.

Toni Scullion: Good morning, everyone. My name is Toni Scullion and I am a computing science teacher from West Lothian. As Talat Yaqoob and Fiona McNeill have said, there is a massive lack of females taking computing science. The figures are absolutely shocking, so I have made it my absolute mission to close the gender gap. As well as trying to do that in my classroom, I have founded my own charity, which is called dressCode. I am doing that on the side, but I have managed to gain funding from JP Morgan, which is fantastic and has really helped me to begin to roll the project out across the country.

It is also about trying to bridge the gap between industry and education. I have had quite a lot of success with that, particularly with three of my senior girls who are what we call Turing's testers. They recently partnered with The Data Lab, and we ran the first international women in data science event, DataFest19. It was all organised by those three amazing girls. It is about trying to empower girls and show them that, when we connect them with industry and give them support, they really can make a difference.

It is a biggie but, yes, I will close the gender gap.

09:45

The Convener: Thank you very much. That is all really helpful. We expect this to be quite a free-flowing discussion, so indicate to me or the clerks when you want to come in.

Rona Mackay (Strathkelvin and Bearsden) (SNP): What do you think are the barriers in terms of gender? Is there anything obvious that you think makes girls not go for STEM subjects?

Toni Scullion: I will unveil a big secret from dressCode. We also have hackathons in industry, but the big secret is that everything that I do in that is exactly the same as what I do with boys in my classroom. I do not believe that what is done needs to be tailored to be more girly. If you speak to a lot of my first-year girls and to the seniors, you will hear that they have no idea about the gender gap. It is about giving them space and using particular language. I do not think that making a big deal out of it helps, to be honest. All the things that I do in my classroom, as well as with dressCode, are really just saying to the girls that they can make of it whatever they want, and we are there to facilitate that.

A major change that is needed is that more modern pedagogy approaches should be taken. For example, the computing curriculum is now really good: it has all been changed. That has been very hard to do, but it is now better. As was said before, teachers are not being upskilled, and that needs to happen. For example, a lot of people still use Notepad for web design, but it is not as exciting as other web design products that are out there.

Time is a biggie: teachers need time. They also need someone who has created "pick up and play" resources who can say, "This is amazing—it's been tried and tested and it works with girls." That is what I am trying to package and roll out through dressCode, but it is difficult.

Role models and creativity are also important, and it is important that the girls work in teams and not just by themselves. When I started the club girls would come along at the start, but then they would stop coming. When we asked them why, they said that it was because none of their friends were coming. Now, we have made it just a girls' club. We do the same as we do with the boys, but they now literally have a space, and they can see their friends coming in. Girls see other girls doing it: they are like role models in school, rather than in industry. It is a hard question: I hope that that helps.

Rona Mackay: Thank you. That was helpful.

Lorna Hay: A lot of it is to do with perceptions: girls need to see positive female role models within STEM. The journey in my school with STEM, in particular in engineering, has been going on for a couple of years now. We always start the year by asking the boys and girls, whatever age they are, to draw an engineer. When we first did it, there was an endless succession of pictures of Bob the Builder in overalls, with a hard hat on, and with tools. That was what was perceived by both boys and girls. Two and a half to three years down the line, the drawings by boys and girls show a mix. We still see Bob the Builder, but we also see female engineers. That is partly because we are exposing the children to positive female role models. We do that physically, with the engineers we bring into the school, and through literature, including with books like "Rosie Revere, Engineer" and "Iggy Peck, Architect" for the younger ones. There are also a lot of initiatives online.

Primary Engineer, which I am an ambassador for, does engagement involving online chat with a wide variety engineers—male, female, young or older. There is also an online initiative that I do with my kids, called "I'm an engineer, get me out of here." The children are hugely engaged with it. They see young females in engineering positions, which brings the matter to the fore. When we first had a relationship with Primary Engineer, we were going to be building cars, and I told the class that we would have an engineer coming to work with us. When the door opened, in walked a really attractive 24-year-old girl with long hair, and the class were literally open-mouthed. In the media and within education, we need to be providing young girls with positive role models from all aspects of STEM.

Talat Yaqoob: What Toni Scullion and Lorna Hay have said is absolutely right. I will emphasise a couple of things. The point about women's spaces and girls' spaces is really important, because we need to do something to counteract what is going on elsewhere. We can have a role model at school assembly, however what is actually needed is sustained activity. We know that single interventions do not work, but sustained intervention over a longer period requires investment, especially with young women. I

emphasise the need for women's spaces in which they feel that they cannot just take a back seat because of their perception that the boys know more.

I would also like to emphasise, as Toni Scullion said, that it is not about changing what engineering, computing or chemistry are. It is not about making chemistry about making a perfume kit—which I have actually seen and rolled my eyes at. It is not about changing what science is: science works the way it works. The difference should be that we provide spaces in which we can encourage and develop confidence in girls and women.

There is also gender stereotyping. There is work to be done with parents on that, because the conversations that happen within the classroom are not enough: it is also about what goes on within the home. We must also raise literacy about STEM among the general public.

Lastly, it is about dealing with sexism in classrooms. Girlguiding Scotland has done a lot on that. We need to tackle language in relation to sexism for teachers and pupils in the classroom. Equate Scotland is working with Edinburgh Napier University on a new course for people who have been in the computing industry who are reskilling as teachers. Equate is doing gender-equality training for them so that in the classroom they feel equipped to deal with such things and are not reinforcing gender stereotypes in the classroom.

Dr McNeill: I echo what others have said. The fundamental issue is socialisation. In the early years of computing, women were very strong and were doing a lot of the important programming, but when, in the 1980s, home computers became available, they were heavily marketed at boys. It became something that boys did at home but girls did not.

That was when we saw the rise of the image of the computer scientist as very nerdy and very male—a very specific type of person. That image is ubiquitous in culture. When we look at what young people watch on television, we see it echoed again and again and again. That image is what they are always presented with as being what a computer scientist, a scientist or an engineer is. That is very hard to combat.

All that has been said about role models is important. I also agree that it is important for teachers. They all—not just computing teachers—have a huge role to play.

The really important time is in primary school and, especially, in the early years. In the "Tapping all our Talents 2018" review we can see that there is a lot of unconscious and conscious bias in schools for pupils right down to age three—"Here are the girls' toys, and there are the boys' toys."

The boys' toys are the STEM-related ones. It is crucial that early years practitioners and primary school teachers have a proper grounding in the issues, and are made much more conscious of how they approach them.

We also need to get into the homes. That is fundamental. It is more difficult and challenging, but I think that most children are not getting those messages at home, so it is really important.

Ross Greer (West Scotland) (Green): My question will follow on from that point. I will focus specifically on the early years and the first couple of years of primary school. We had, a year to 18 months ago in the Parliament, a conference involving Microsoft, at which Iain Gray and I spoke. One of the issues that was highlighted at it was the huge volume of evidence about gender stereotypes being embedded in people by the age of seven. After that we are, essentially, undoing damage that has already been done. Obviously, that is a huge issue at that phase, but it is not the only issue in STEM education that starts off in the early years and primary school.

I am interested in hearing folks' impressions of the state of play in delivery of STEM education in the early years and primaries 1 to 3. We are very well aware of the wider socialisation problems that need to be tackled, but how equipped do you think most primary teachers and early years practitioners are to deliver STEM education? We have heard some really good case studies, and Lorna Hay talked about best practice.

Lorna Hay: There are pockets of very good work and there are pockets where not a lot has been done. It comes down to teacher confidence. In the research that I have looked at and, certainly in my setting and focusing on engineering, confidence about teaching is not high. The research will tell you that that is detrimental to the delivery of STEM education.

I was quite surprised that the report of the first year of the strategy said that 63 per cent of teachers said that they either agreed or strongly agreed that they were confident in teaching STEM subjects. I feel that that figure is rather high, so I wondered about it. When I asked the staff in my school about this, I made a point of separating the subjects. We are talking about science, technology, engineering and maths, so we have to be very cautious about bundling the four together and asking teachers whether they are confident about teaching STEM. You will find that probably the majority are very confident about teaching maths and, possibly, about science and basic information and communication technology, but they are not confident at all about teaching computer science and engineering.

To me, the statistic is perhaps a little misleading, so I suggest that it might be beneficial to break it down: we should ask teachers about their confidence in teaching science, technology, engineering and maths separately. Bundling them together would not give a true reflection of my experience, or that of others.

It comes down to the quality of continuing professional development. I am fortunate to have done the postgraduate certificate when it was part funded by Skills Development Scotland. It was delivered and accredited, through a Primary Engineer initiative, with 60 masters credits from the University of Strathclyde. That is high-quality CPD that has impacted hugely on my practice. I got the professional recognition, regardless, from the General Teaching Council, and I was given the choice to pay the University of Strathclyde for the masters credits myself, which I decided to do because it was a lot of work and I did not want to come away with nothing.

Some teachers are not financially in a position to access high-quality CPD to change their pedagogy and make them better suited for teaching STEM. That course is no longer funded, so teachers would need to spend nearly £2,000, which is a lot of money. People outside teaching asked me what I was getting in return for it, and whether I was getting a pay rise. I did not get a pay rise; I did it for me, in order to enhance my teaching. We need to think about how we present CPD in order to increase confidence, and we need to share good practice.

We are fortunate to have created in our school a real buzz around STEM. We had a big STEM showcase event, to which lots of people came. Parents came and engaged with their children in engineering and STEM activities. They said, "Wow! I didn't know this was going on. My child is so enthused!" We need now to disseminate that throughout the cluster of schools and pass that knowledge on.

Jenny Gilruth (Mid Fife and Glenrothes) (SNP): I have a brief supplementary question about teacher confidence. I was quite taken by Lorna Hay's point, and Toni Scullion spoke about upskilling the profession. On initial teacher education, I see that in Professor Wall's submission there was a recommendation that national 5 in science and higher maths, I think, be included for all primary teachers in initial teacher education. Do you, as practitioners, agree with that?

10:00

Lorna Hay: Yes, I think that that would be a solution. It would mean that teachers were coming in with some skill and confidence in teaching science.

We have to be careful, however. There is already an issue in recruiting teachers, and raising the bar in that way will not help that situation. Alternatively, once we have the teachers, what can we do when they are in initial teacher education? I did the postgraduate teaching qualification, having come from my previous career as a public relations consultant. My training was condensed into a very short time, and it included lectures and practicals in science. Think about what we ask teachers to do: the primary teacher is a jack of all trades and master of none, and there are many demands in the curriculum in respect of what we are expected to teach. Perhaps we should not create more barriers to people coming into education, but think about how, once they are on the course, we can retain them and improve the quality of their personal learning. I do not know what Toni Scullion thinks about that.

Toni Scullion: I agree. Including those subjects is a great idea in principle, but it is already difficult to get people into the profession. I know that, in my school, a pupil who is very good at English tends not to do sciences, which might put up a barrier.

There might be solutions at secondary school. I am a computing science expert, so perhaps there could be more freedom in my curriculum to allow me to help primary schools to upskill, as Lorna Hay mentioned. That could be done through CPD and providing more opportunities and ease of access for secondary school teachers to go to primary schools to help them. I am definitely not an expert in English or anything else, but if there was a particular primary school teacher in my cluster who was struggling with computing science, I would be more than willing to go there. However, it is about constraints on the school.

Including English, maths and science in ITE would be fantastic, but would it put more people off? It might, but it would be fantastic because they would have a wide array of experience that would be very useful in the classroom. It is definitely the case in my school—this is not a sweeping statement—that there are kids who do English, or who do science and maths, but they do not do all three. It is quite rare for someone to do that. More flexibility between primary and secondary schools would really help.

Professor Wall: I will pick up on the point about qualifications for primary school staff. My report did not say that we should introduce the qualification in ITE, but that it would be done over a period of time. You would not say to people in their last year of school, "By the way—you've got to get higher maths" or whatever. The requirement

would be signposted long before the event, so people would work towards it.

Mathematics is as necessary as English. It is another language; it is not a topic one learns like chemistry, so that one can do some chemical work or something like that. Maths is essential to almost any job. For example, recent developments in English literature rely heavily on computers and detailed analysis, such that there is a problem if people cannot properly use and understand spreadsheets.

People say that that will put off good teachers, but good teachers have already passed many different exams. Becoming a teacher is not about saying, "Look, I'm good with children, so let me loose in a classroom." It is a skilled and professional job in which the teacher needs to develop technical knowledge and pedagogical skills that are, preferably, integrated. It is not necessarily the case that a good mathematician will be a good teacher in mathematics. That integration is important.

That brings me to the wider point that I wanted to make, which is that systemic change is required. Role models are good, but Government, education, science and local authorities should be creating a situation in which more women engineers are coming through. There would then be no need for role models because women in such roles would be all around the place and young people would not be surprised when a woman engineer walked into their classroom. Role models are all very well, but they are a local and short-term initiative. The fundamental question for Scottish education is how we will shift the game.

Lorna Hay mentioned "pockets" of excellence, but there are more than a few: there is a substantial number. Some local authorities are better than others, some schools are better than others and so on. The question is how we spread the excellence and pass on learning. The role of Education Scotland is crucial in terms of encouragement and support, and in terms of its inspection role.

On equalities, if you look, as we did, at the last five inspection reports of primary schools in a year, equalities was dealt with in one case in two sentences, and in the others in one sentence. There was clearly a formula. I am not saying that they had not checked, but there was no sense that the schools had had to explain what they did and how they did it, or of whether they had used role models, whether they were trying to create spaces for girls and so on.

There is an easy way in which to ensure over time that inspectors pay more careful attention. It requires a strategic systemic change rather than encouragement and exhortation. We do not want any more encouragement and we do not want any more exhortation—we want strategic changes to be practically implemented.

Professor Hunter: I will make a very short point on the pace of change that is needed. What Professor Wall said is absolutely true. New teachers being better informed about mathematics is important, but it would take too long to enable that; it will not happen in the near future. CPD is probably the solution to that.

It is much more important to do something in the early years. It has already been mentioned, but I, too, want to emphasise that getting into homes and into communities to publicise STEM is important for the future of our country.

Dr McNeill: On science qualifications for primary school teaching, the learned societies group has been pushing for it to be made a requirement that primary school teachers have at least one level 5 qualification in science. We accept that there are problems about recruitment, but we feel that maintaining standards is the sine qua non. It is really important and we need to find flexible solutions.

One of the problems is that STEM teachers must have higher English, which a lot of STEM students do not do. Our approach is not to lower standards to allow more teachers in but to consider flexible solutions. The Scottish Further and Higher Education Funding Council recommends that the education colleges accept students without higher English on the understanding that they will do it while they are training; they can do it on the fly. There can be flexible solutions. Unfortunately, such solutions are not implemented much at the moment. We could accept primary school teachers who do not have any science qualifications and then help them to gain those qualifications as they train, so that when they go into a school they have a solid science foundation.

The Convener: Is your question on this area, Dr Allan?

Dr Alasdair Allan (Na h-Eileanan an Iar) (SNP): It is on the question of qualifications in general and the number of people coming out of school with highers in science.

The Convener: A couple of members have questions before we move on to that subject. It is worth pointing out that the Barcelona one-plus-two languages learning model actually forced a requirement for language, which I suppose is a little bit of a precedent in the requirements for primary school teaching.

Gil Paterson (Clydebank and Milngavie) (SNP): My daughter has just entered university and, in my experience, STEM is practically not on

the agenda with most parents. Many parents are the big influencers in the direction and the subjects that children take. Again, just from paying attention to what was going on, I believe that that influence starts at primary school. Ross Greer made that point.

Huge numbers are excluded. That is not to say that STEM is not a good thing; I just do not think that a lot of people understand the opportunities that present themselves to parents and children. The question is what we can do to influence the parents rather than the teachers and the schools. There is an enormous barrier, but there is a great opportunity. What can we do to inform parents of what is available?

Talat Yaqoob: Linked to that is the difference between affluent and socially deprived areas in Scotland when it comes to access to STEM. We see more role models from industry coming in or community-based learning in affluent areas, compared with socially deprived areas and rural communities. If we are going to do something about this, it has to be done Scotland-wide. There has to be a coherent strategy that is invested in across the board, rather than a focus on the lowest hanging fruit in areas where there is already access to opportunity and investment. Particularly in the early years and primary school, more parent and community engagement is happening in affluent areas. Any investigation needs to focus on how we do that in rural communities and areas of social deprivation.

Dr McNeill: I agree that that is vital. Some kind of public education campaign is necessary. For example, I do a code club at my children's school and one of the parents came up to me and said, "My son is really enjoying this, but I don't want to encourage him too much because there aren't a lot of career opportunities and it's a very crowded market." That is crazy. There is an enormous skills gap in this market, but that parent—she was a very educated woman—was not aware of that. Spreading that message, not just among the parents but also in the schools, is important. A lot of schools are not advising the students as well as they might be about where the opportunities lie.

Lorna Hay: That marries with the research that I did in industry when I did my postgrad and spoke to engineers about their career aspirations and inspirations. I cannot remember the exact statistic, but when I asked engineers why they had chosen engineering, an overwhelming majority said there had been some kind of family influence—someone in the family either was an engineer or valued engineering as a career choice. It is all about building that STEM capital, because a lot of people do not have any STEM capital.

I believe that the perceptions out in the media are exactly as Gil Paterson suggested. We need to raise that and to do more of what we have done within schools; we need to engage, to get parents and learners to tinker together, to realise how the skills that they are learning apply to real life and to know what the opportunities are outside school so that when a child says that they want to do engineering, the parent says that that is a good career choice.

I spoke to engineers who said that when they said that they wanted to be an engineer, their parents tried to persuade them otherwise because the family did not value engineering as a career. There is an incredibly biased perception of engineering out there and it is ingrained in society. We need to work hard to overcome that.

Professor Wall: What we need is a reprint of Nevil Shute—almost all his heroes were engineers and they were very successful in all sorts of ways. However, that is by the by.

I want to pick up on Talat Yaqoob's point about schools in poorer areas. I am the chair of the Scottish Council for Development and Industry, which runs the young engineers and science clubs. I am also on the board of the science festival, which runs generation science; we see 50,000 to 60,000 primary school children every year. Both of those things rely upon private sector funding and some charity interest. Teachers find them extremely valuable. It is about having someone come in from the outside, and we are very careful about gender balance in the way we do things.

That is not uninteresting in itself, but I mention it also because any discussion of these issues, as we move round the table, needs to be set in the context of resources. It is not difficult to say, "If we did this, it would change things." It would change things, but the question is whether we get the right resources put in the right place to do it.

Toni Scullion: I want to pick up on two points from what Professor Wall and Talat Yaqoob said. I am at a Scottish attainment school in West Lothian, so we have high levels of deprivation. We do really well with girls, but we face barriers. For example, there are amazing initiatives such as the cyber security Christmas lectures but sometimes we cannot go because we do not have money for buses. We do not want to ask the kids because we know their backgrounds and they do not necessarily have the money, either. That is a simple thing that could easily be fixed if we could apply for some kind of budget. Having to beg for money is difficult—it works, but it is really hard and it definitely puts teachers off.

Mr Paterson talked about raising aspirations and getting parents involved. One simple initiative that was used recently at Sky at Livingston was a parents' night, which people brought their kids

along to. They spoke to all the staff in Sky; it was fantastic and very well received.

Those were two examples of simple things that might help.

10:15

Liz Smith (Mid Scotland and Fife) (Con): I have two questions for clarification, the first of which is for Dr McNeill. Is it the recommendation that a primary school should have a dedicated science teacher if at all possible? Iain Gray and I were at the conference at which the Royal Society of Chemistry made that policy recommendation five years ago. Can I be absolutely clear that that is your recommendation?

Dr McNeill: No. What the LSG has been recommending is that all primary teachers have some science qualification—not that any of them has particular skills, but that they have at least a national 5 so that any primary teacher has a basic understanding. Having a science teacher in a primary school sounds like a good idea, but it is not something that we have particularly discussed or pushed in the LSG.

Liz Smith: Professor Wall, I think that you said—please correct me if I am wrong—that there were various things that did not make it into your report. Can you clarify what those things were?

Professor Wall: I cannot, off the top of my head. I could write a letter to the clerk to explain.

Liz Smith: If there were any recommendations that were not taken up, that would be helpful. Thank you.

Professor Wall: If you had asked me a couple of years ago, I could have reeled it off, but it is two and a half or three years ago. I am slightly weak on that one.

Liz Smith: I asked the question because the committee has been interested in STEM issues for quite some time. Criticisms are made—this is not a party-political point at all—that we are all responsible for not delivering on some of the recommendations that have come out of previous studies. If there were gaps, I would be interested in knowing what they were.

Professor Wall: We always took the view as a committee that it was our job to make our recommendations as best as we thought fit, but it is Government's responsibility and duty to determine these things. We can get obsessed with education, but there are health issues, transport issues and so on. Government has to make judgments.

I will tell you what irritated us. Our report had something like 50 or 60 detailed recommendations. The past approach by most Governments, of any colour—in fact, this was the approach to the first SEEAG group report—has been to respond to those recommendations by saying, "Yes, we agree with this and we will do that" or, "This is a good idea, but it is too early" or, "No, we disagree with it." Nobody is perfect, but what made us angry was the failure to engage and then just picking out the things that were put into the strategy.

We did not expect everything that we suggested to be taken up, and some things were not entirely agreed by everybody. We were not keen on the idea of having a science specialist in a primary school. We could see its merits, but our worry was that it would then become a little silo, and that people might think, "We don't have to do science, because Mrs Joseph will do the science. We don't have to bother anymore."

The Convener: Both practitioners have mentioned clusters and the primary school cluster programme. That is not universal throughout Scotland—not everyone signs up to that. Could you tell us what that means to you and what added value that gives?

Lorna Hay: The cluster is the group of primary schools that feed into a secondary school. At our school, we have had a big push on STEM and we are doing a lot of positive things. Other people have said that what we are doing is positive, but we are on a journey and we need to embed the approach in the school. I am involved in another group in Fife that is considering how we can bring schools together to share what is going on in the various pockets of best practice.

There is an issue around time—Toni Scullion and I were talking about that before we came in. Time is a huge issue for teachers, as is workload, which is a whole different issue. The pay campaign is still on-going, and we have been told that workload will be addressed as part of that package. It needs to be addressed because, even in relation to the sharing events that I mentioned, time must be scheduled for them and preparation must be done for them. We had a big STEM showcase at our school and all the staff spent time preparing for that in addition to keeping a classroom running with all the subjects: literacy, gym, science, religious and moral education—the whole lot. Time and workload represent a massive barrier to what we are trying to do, and we need to look at how can we give teachers the flexibility and time to lead on these things and disseminate those skills and strengths among the clusters.

Every school has a school quality improvement plan, and gender bias and STEM have been prioritised in ours—they are prioritised in all the schools in our cluster, so we are all working together towards the same end. We need to ensure that all schools in all the clusters across

Scotland prioritise those issues in their SQIPs. I am not saying that everything that we do is great, but we have had success in some areas. There are other schools that are doing amazing things as well. However, all the schools in a cluster need to prioritise the same issues, so that, by the time that the learners come to high school, teachers such as Toni Scullion find that there is not a big discrepancy in their skills and knowledge.

Toni Scullion: My school has a primary cluster that is made up of the primary schools that feed into our secondary, and we also work with other secondary schools—there are 11 secondary schools in West Lothian. We have no communication with primary schools when it comes to computing, but I know that work is done on English and maths. As Lorna Hay was saying, we get one day—I think—every year when we work with a specific set of secondary schools that are close to us. However, the things that they do are totally different from the things that we do, and there is no wriggle room or flexibility to say, "We do similar things to this other school, so we would quite like to work with it instead." There is none of that. Such work between secondary schools is encouraged, but there is no time to do it, apart from that one day when we are forced to work with people and simply bring things along to talk about. It is just a one-off event rather than an on-going thing that would allow us to really work together and build on that work.

There is so much bureaucracy in schools and it is so difficult to get anything off the ground that I genuinely think that it is easier to make waves across the whole of Scotland—through social media and things like my little charity and the cyber security competitions that we run—than it is to do so in my school, which is ridiculous.

I cannot give you an answer, but I think that teachers need to be brave and just use social media and so on instead of going through the official protocols, because it is so hard to do that.

Professor Iain Hunter: I do not know if the point of your question was also about the maturation of the cluster programme. It is more mature in some geographic locations than others. Obviously, the two practitioners who are here today are in locations where it is very mature, but in some locations it has hardly started. That is important to note, and we should try to accelerate the adoption of the approach.

In that context, I note the establishment in recent years of regional improvement collaboratives, which sit at a high level in the infrastructure. RICs seem to have been given largesse—I was going to say "allowed", but I will not, as that is pejorative—to create their own agendas, set their own priorities and deal with their own regional issues. It saddens me to see the lack of STEM issues in some of the script that is now being written by some RICs.

Professor Ian Wall: On the question of clusters, they are absolutely vital. They cover many things, including the transition from primary to secondary, which was touched on earlier. Specialist teachers in primary schools have been mentioned, and there are specialist teachers in secondary schools—they are in your cluster. If you want to get a bit of strong support from a chemistry teacher, a physics teacher or a maths teacher, you can, if there is a functioning cluster that works well.

The Scottish Schools Education Research Centre has a programme that is funded by the Government and works with secondary schools and their clusters to develop their science provision. However, the process is extremely slow. It works with a number of local authorities each year, and the contact happens only that one time and then the authorities are left to get on with it. The work needs to be sustained.

We cannot overestimate the power of clusters, but the issue leads on to a question that has been raised by a number of the people speaking today about the issue of time in schools. One of the areas that was ignored in our report was our point about that issue. A lot of the things that we talk about require quality time for teachers to engage, whether they are creating IDL or doing proper cluster work and things like that. To have a cluster meeting of secondary school teachers and primary school teachers takes half a day, and that is quite a lot out of school time. All schools are running in an incredibly tight fashion. You are fortunate to have active teachers here, because, if one teacher falls ill, no one leaves the school. The situation is quite disastrous now.

At the same time, we have a culture of overwork in schools. There is an obsession: as long as a pupil is sitting in front of a teacher, she must be doing okay. That is just not true, and all the evidence shows that. In our report, there was a section dealing with that. There are no magic bullets, but, if you accept that that is the problem, you can start working on a number of different things. One of those things is to reduce contact time. You have all heard of Pasi Sahlberg, and one of his dictums is, "Teach less, learn more." There is a range of issues around that that we tried to unpack in the report as we suggested a way forward. If you release time, a lot of the things that are talked about become much easier to achieve.

Dr Allan: I am not going to open up the discussion about subject choice, because the committee is going to do a separate piece of work on that, but I want to pick up on an issue that Dr McNeill raised earlier about the number of young

people coming out of school with STEM qualifications. You mentioned that, although there has been an increase in the number of highers, the number of STEM highers seems to have declined. However, my understanding is that there are more young people coming out of school with higher maths than before. I suspect that that means that the issue is more localised to some specific science subjects. Is that correct?

On a related issue, what can we do in the first three years of broad general education of secondary to ensure that people feel that they have a strong enough grounding to take up science subjects in fifth and sixth year?

Dr Fiona McNeill: I do not have the figures in front of me for which subjects are going up and which are going down, but I can find them. Certainly, the issue affects some STEM subjects more than others. As is always the case, computing is probably the worst—the number of highers in computing is going down quite alarmingly. Other STEM subjects are maybe a little bit more stable. I agree that it is important to look into the details. I can find the data and send that around, if that is useful.

In terms of what we can do to enthuse learners, if you are forcing them at the end of S3—or even, in some schools, at the end of S2—to choose six subjects, that is always going to squeeze out subjects that are not the core subjects that they have been studying all the way through. Learners are more likely to take STEM courses leading to qualifications in later years if STEM is ingrained in the broad general education phase—not just in S1 to S3, but also in primary school. The more that learners see that STEM is something they can understand and is something that leads to things that they find interesting, the more likely they are to gain STEM qualifications later on. Strengthening STEM education the whole way through is important.

Liz Turner: We are all in agreement about the need to strengthen STEM throughout education, but I believe that the focus needs to be at primary school level. At my daughter's school, for example, pupils pick their subjects at the end of the first year. If you are not engaging them with science in primary school, they are not going to pick those subjects when they get to secondary school.

I want to pick up on a point that Toni Scullion made earlier about lift-and-use resources. There are lots of great resources out there for teachers, but the issue comes back to time and confidence. The barefoot resources, which are now being used in about 69 per cent of primary schools in some shape or fashion, are all about helping teachers to build their confidence to a point at which they can teach computational thinking. That also touches on the point about how we engage parents. The approach should not necessarily involve talking to a seven-year-old child or their parents about a career in computing science; it should involve talking to them about the importance of computational thinking across all the subjects.

Teachers want resources that they can use across the curriculum, so there is a point to be made about not treating things in silos and instead looking at them in a cross-curricular way. It strikes me that, if those lift-and-use resources that match the Scottish curriculum do not exist for secondary schools, we should look to explore that and develop some.

Toni Scullion: In my school, learners pick their subjects in second year, but then they have to drop some. If they decide not to pick any STEM subjects, they are not allowed to pick them up; they just keep dropping subjects. It is just bizarre. You do not know what you want to be when you are 12; often, what you want to be changes over time. If the approach to subject choice does not include the flexibility to pick up something new, we have halted that opportunity right there, which is really unfortunate.

10:30

Iain Gray (East Lothian) (Lab): I have two questions, which track back to two different strands. The first is for Toni Scullion and maybe Fiona McNeill. We have talked a bit about poor understanding of career opportunities in engineering and computer science and coding. Is there not the opposite problem that one of the reasons why computer science teachers cannot be recruited is that they can be paid a lot more for working in industry? How on earth do we deal with that?

My other question is for Professor Iain Hunter and Professor Ian Wall. The latter said in his submission:

"We have, as a country, been here before"

in 2003, 2012 and 2016. Although he would not say that a strategy has not been implemented, he thinks that a strategy has not been implemented with the required urgency and vigour. Will you enlarge on that? Does Iain Hunter have a view on that, given that he is involved in the implementation group, as he has pointed out? Is that true? What are the difficulties in taking a strategy forward?

Dr McNeill: That is undoubtedly a huge issue. We do not have enough computing graduates. Industry is desperate for them, pays them very well and is quite aggressive in attracting them. There are simply not enough students to go round, and teaching loses out. The solution is to get

enthused young people to study computing more and to get more teachers into schools so that more people who do computing come through.

Iain Gray: Salaries will therefore get pushed down in the industry.

Dr McNeill: The salary question is very interesting. Judy Robertson at Moray House school of education has been doing interesting research on salaries and the difference between salaries in the computing industry and teaching. The difference is not nearly as big as we would think. There are people in the tech industry who make huge amounts of money, but most people in it make a little bit more than teachers—there is not a huge difference. I think that the students do not understand that. Perhaps they see themselves as being the ones who will get the star job at Rockstar North or whatever. Promoting teaching as a really rewarding career that has a decent salary—the salary is not poor; it is not amazingly high, but it is decent—is really important.

As I have said, there is a flexible entry requirement. In the past four years, three of my best students—they were excellent—really wanted to go into teaching, but none of them had higher English. All the education institutes that they applied to said, "Absolutely not. You have to take higher English before we will even consider you." That means taking a year out. They cannot afford to do that, and they will be lost to the teaching industry. Allowing flexible approaches without lowering standards and the promotion of teaching are really important.

The industry goes into universities, grabs students and sells itself. It gives them all kinds of freebies and is really visible. Teaching is simply not visible, and it really needs to be. That is really important.

Toni Scullion: To build on Fiona McNeill's point, it is a matter of showing kids what is out there, getting them in early at high school and encouraging them. A lot of people think that computing simply involves being a programmer such as a software developer and just sitting by yourself, but that is not the case—there is so much out there.

As part of the dressCode project, I am doing a choose computing science campaign, which I am going to roll out across the country. That campaign involves trying to raise teachers' awareness that they should big up the jobs. They can say that a person can be a designer and be paid massive amounts of money if they are really creative, but they can also try to keep them in the classroom by saying, "You could be like me." They could help to get people into teaching and try to show all the jobs that are out there.

Oliver Mundell (Dumfriesshire) (Con): We have only one industry representative here. Is there more that industry can do? I worry because, if we take everyone out of the teaching pool and do not help to bring new skills through, businesses such as Rockstar North will eventually have quite a big problem in that there will be no one to fulfil their needs. Is there a link-up between the teaching shortage and businesses? Could industry do more?

Professor Wall: The point about the number of reports was partly in answer to Iain Hunter's earlier comment about doing something about improving the standards of teachers who are starting to teach and the problem taking a long time to fix. If we had started in 2003, we would have had 16 years' worth of fixing already.

We have not touched so far on the problem of the administration of education. Iain Hunter referred to RICs. Whatever their merits or strengths, they are to do with an administrative restructuring rather than addressing an education issue. Local authorities have lost their quality improvement officers. I am old enough to remember when local authorities had subject specialists. They became QIOs and their numbers reduced. The number of schoolteachers continues to reduce proportionately. RICs may have some money, but I suspect that it is a drop in the ocean compared with what local authorities used to spend on the issues 20 years ago.

The roles of Education Scotland and the inspectorate, for example, are critical to the success of education if they motor in the right way. A lot of what all politicians and the civil servants who respond to them do is really short term. A minor change in a figure is either a triumph beyond parallel or a disaster that means that Scottish education is going to the dogs. All politicians of all parties play that game. It is a game because it is meaningless, and it is counterproductive to what we are all trying to do.

The current Administration's report on its STEM strategy for this year is a really poor piece of work. If it was submitted as an essay to a schoolteacher or as a report on a project—that is what it is; it is a report on a project that the Government established to be carried through with lots of good stuff in it—it would get a C minus if the Administration was lucky, or a D plus. Actually, I think that it would be a fail. We should simply look at the figures. It is a piece of flimflam, and it would be about a quarter of the length that it is if all the visuals and meaningless stuff were taken out.

That is symptomatic of a problem that is not the problem of one party; it is a problem across the piece. In some respects, we are being let down. There are good recommendations, good work and good officers, but it is a matter of beck and call,

and there is a shortage of the resources that are needed strategically to say with confidence, "Right. We are going to do this for the next five years and we don't expect answers in year 1 or even in year 3, but we expect to see a glimmer of hope in year 3 and to begin to motor by year 5." Improving an education system needs a long-term strategy. That is why reports such as "Tapping all our Talents 2018" are really valuable to society. However, an administration with a small "a" and an Administration with a big "A" putting those things into place in a professional manner is more valuable.

Professor Hunter: We have talked about the resource that the Scottish Government deploys. As I mentioned, I got into the issue as a professional scientist. We have all signed up to STEM and done outreach—indeed, I have done so for a number of decades. What impact has that had? Over the past 15 years, we have talked; the big question is whether we are making a difference.

Mr Gray asked me to comment specifically on what is happening right now. Talat Yaqoob was on the group that we looked to advise on the policy. I am holding up two pieces of paper with datasets that are not perfect; they will never be. The information is from May 2017; we upgraded it until the turn of last year.

The report that was referred to tries to capture whether we are making a difference. To be honest, a lot of the changes that are reported in the first report on the STEM strategy, which came out in February, were already in process before action took place. However, it is important to look at the issue annually to see whether progress is being made or, if it is not being made, to address that rather than come back in five years' time and say that progress did not happen, in the same way that Professor Wall's initial submission said that we did something five years ago and not a lot has happened.

It is important to emphasise that the current five-year strategy bridges into the next Scottish Government, as there will be an election before the end of that five-year period. It will be important to take stock four years into the strategy, which is when the election cycle for MSPs comes up, to see what has happened.

The Convener: Could we return to Oliver Mundell's point, which is about industry engagement? Ms Yaqoob, you talked about whole Scotland strategies and about inequality in relation to rural areas, and the example was given of Sky in West Lothian. I have a concern about industry engagement. If rural areas and deindustrialised areas do not have high-tech, high-end engineering companies, are people missing out?

Oliver Mundell: My question was more about what industry is doing to encourage people into teaching, as opposed to concentrating on immediate recruitment needs.

The Convener: I misunderstood—sorry.

Oliver Mundell: I have a worry. The Government has set up a scheme to encourage people in industry to retrain as teachers, but my perception is that industry is a bit reluctant to let people go. At the graduate recruitment level, industry is more interested in getting hold of the available people now, rather than encouraging some of those people to go into teaching.

The Convener: Sorry, I misunderstood you. Ms Turner, do you want to come in on Oliver Mundell's point?

Liz Turner: I am not sure that I can speak conclusively about industry or that we do anything to encourage people into teaching, although I am happy to take that back to discuss with colleagues. I am not aware that we do anything proactive in terms of bursaries and so on, if that is what Oliver Mundell was asking about.

The rural point is, I think, a really genuine one. A lot of the big IT and communications companies are in the central belt, although, to be honest, given technology, flexible working and home working, an organisation such as ours has people all over the country. We have people who go out and volunteer to run free workshops for the barefoot programme. Those workshops are happening everywhere in Scotland. We had requests from primary schools, including on very remote islands, and those workshops are running there now—they are streamed online for them.

It is not the perfect solution, but it is about using the technology in the best way and making sure that rural areas are not missing out. Everything that we provide around barefoot is free; it is all downloadable, so teachers do not have to come to a central location to have that training perhaps in the way that they do with CPD and so on.

We also work a lot with partners. I mentioned our work with young engineers and science clubs, and we have trained people in those teams to deliver barefoot, as part of the CPD offering to teachers. That means that they are out and about in rural areas as well as in urban areas. We are very conscious of finding ways around that problem.

Talat Yaqoob: The issue for industry is that there is an immediate need—there is an immediate skills shortage across STEM—so industry is naturally looking to fill those posts. According to SDS, there are 12,800 digital technology opportunities every year, and according to Engineering UK, the United Kingdom

will need 185,000 more engineers over the next five years. It is natural that industry will not be pushing graduates down the teaching route. It is for Government and local authorities to do that push, to make visible why teaching is valuable and to have, as Fiona McNeill said, that public engagement.

Although we have talked, rightly, about the early years and primary education, I am very aware that the skills shortage in STEM is now. It is important to note that, according to "Tapping all our Talents", only 30 per cent of women who graduate with a STEM qualification stay in STEM-related jobs in the long term. We have to do something about that pipeline. The issue is here and now, as well as in five years' time. Certainly from Equate Scotland's point of view and from the research that we have done, we can see that the more industry engagement that women have while they are qualifying, whether they are at college or university, the higher the likelihood that they will stay in the industry in the longer term, because they know what the industry is about.

Our careerwise summer placements are the only paid placement opportunities for women studying STEM in Scotland. On average, 30 per cent of them stay in the sector, but almost 60 per cent stay in the sector if they have gone through our placements. That is something that works, and we are very aware that it needs to be expanded and that we need more industry partners to participate in it. It has been going for only six years, but those who came through it in the first two years are almost twice as likely to stay in the industry in the long term. In further and higher education, there are things that we can do now with industry to address the skills shortage.

10:45

Lorna Hay: I absolutely agree with Talat Yaqoob. I come at this from an early years perspective, and I know that what I do now will not be seen for many years. The issue needs to be addressed on an immediate level.

I cannot comment about people in industry being encouraged to become teachers, but I want to go back to the point about relationships between industry and schools and what industry is doing now to engage with schools. In the research by Bill Lucas, "Thinking Like an Engineer", one of the signature pedagogies that is put forward for the teaching of engineering is authentic learning with engineers.

I have seen the benefit of that approach in my own setting. Last month, 16 engineers came into school through the STEM ambassador network. That network is doing fantastic things, although

perhaps we need to look at increasing its funding so that it can do more.

There are two benefits to such visits, to my mind. First, those engineers are role models. Young people see them—they get to discuss their ideas for inventions with real engineers, so the visits are in a real context. As a result—and I know that what they say now might not be what they do later—a lot of young people in the school are vocalising their wish to be an engineer. Further, it is not just that they want to be an engineer; one girl told me that she is going to be a civil engineer, and another told me that she is going to be an aeronautical engineer.

The second benefit relates to teacher confidence. When I started working alongside a real engineer, whether it was building cars or having the children invent solutions to problems that they had come up with, I got a huge amount of confidence.

The STEM ambassador network is doing very well, and I believe that the numbers are increasing. However, companies also face a lot of financial barriers, because they do not have the money to release people work with schools. I wanted my husband, who is a software engineer, to come in to speak to the children, and he had to do that on one of his days off because there was no money to release him. Perhaps we need to look at funding companies to do the engagement that Liz Turner said that she was doing. Such engagement is important for teachers' confidence and their CPD, but also in relation to learning.

The Convener: I am conscious that we still need to hear from Ms Gilruth and Ms Turner. We have literally only two minutes left, because Ms Scullion has a higher class to get to—there are exams in nine days, so we do not want to delay her. I ask for very quick contributions, if that is okay.

Jenny Gilruth: I will be very quick, convener.

Schools can only do so much, and we have focused quite a lot on school education. I want to go back to a point about industry and ask whether there is still cultural resistance with regard to stereotypes in industry. Perhaps Liz Turner might be able to answer that.

Lorna Hay will not like to hear this story about a recent meeting that I had with the managing director of a local company in Glenrothes. He brought a number of his employees with him, and they were all male. I asked him, "Where are the women?" and he said, "We do not have any. We cannot get them—and, obviously, it is the best person for the job." I was quite taken aback by that, because he did not recognise that he had a corporate or social responsibility to do more as an

employer. Do you think those stereotypes pervade industry?

Liz Turner: I do not think that they pervade IT and communications. I think that industry genuinely wants more women and that we recognise the contribution that they make.

There are lots of initiatives that we are trying to support through our approach to corporate responsibility. I also want to mention volunteering as being perhaps the route to go down in terms of business engagement. I think that most of the big companies are genuinely doing such things. We give people three days a year to go out and volunteer. Some of them will support initiatives such as barefoot and others will go out and do other things, but tapping into that approach is important. There are a lot of calls on industry to support a lot of things, such as developing the young workforce or going out to individual schools that want us to come in. The sheer volume of requests that come in every week means that a much simpler, better-quality response is for us to provide things that anyone can access, such as free, downloadable resources.

I think that there is a genuine desire and that people recognise that they need to support initiatives, such as smart sense and so on, that encourage women into the industry.

Talat Yaqoob: I do not want to contradict that entirely, but the reality is that although there is a lot of goodwill for working with schools and doing things with girls, I think that there is a difference when it comes to recruiting and retaining women. All the women we work with describe their experience of sexism and unconscious bias, and while there is goodwill, there is also a significant amount that industry needs to do.

We tend to find that, when we look at a company's C level or management level or its equality and diversity strategy, all the right things are there, but when it comes to the culture, particularly at the middle management level, there needs to be a significant amount of equality and diversity training, learning and knowledge so that culture change happens. There is a difference between supporting the agenda and pursuing it with schools and then taking positive action measures, for example, when it comes to women. That is the bit that is not there, so it does not surprise me that Jenny Gilruth has come across that attitude. It is still prevalent, although industry is very supportive.

Dr McNeill: My point is almost the same. There have been great strides in industry, which is great. However, there are still huge areas of tech industry that are absolutely toxic for women. Sometimes, I am hesitant to encourage girls to go into tech because in some areas it is just really hard. Good work is being done and we really need to continue that because the problem is not solved.

The Convener: I am going to have to call things to a halt. I thank everyone who has taken part this morning—it has been really helpful. The committee will have an inquiry later in the year, and I am sure there will be many more opportunities to engage. If you feel that there is anything you have not been able to say today that you would like to pass on to us, we would be delighted to hear from you again.

10:52

Meeting continued in private until 12:11.

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