



Revised transcript of evidence taken before

**The Select Committee on Digital Skills**

Inquiry on

**DIGITAL SKILLS**

*Evidence Session No. 12*

*Heard in Public*

*Questions 143 - 157*

TUESDAY 21 OCTOBER 2014

10.15 am

Witnesses: Dr Bill Mitchell, Professor Simon Peyton Jones, Charlie Taylor and Sir Andrew Carter

USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on [www.parliamentlive.tv](http://www.parliamentlive.tv).

### Members present

Baroness Morgan of Huyton (Chairman)  
 Lord Aberdare  
 Baroness Garden of Frognal  
 Lord Giddens  
 Lord Haskel  
 Lord Holmes of Richmond  
 Lord Janvrin  
 Lord Kirkwood of Kirkhope  
 Lord Lucas  
 Lord Macdonald of Tradeston  
 Baroness O’Cathain

---

### Examination of Witnesses

**Dr Bill Mitchell**, BCS Director, Academy of Computing, BCS, The Chartered Institute, for IT, **Professor Simon Peyton Jones**, Chair, Computing At Schools, **Charlie Taylor**, Chief Executive, National College for Teaching and Leadership, and **Sir Andrew Carter**, Head Teacher, South Farnham School

**Q143 The Chairman:** Thank you very much for joining us this morning and helping us with our deliberations. I will do a bit of housekeeping first. You have a list of interests that have been declared by the Committee members. These were declared orally by members at the previous sessions in July and can be found in the transcripts.

This is a formal evidence-taking session of the Committee and a full note will be taken. It will be put on the public record in printed form and on the parliamentary website. You will be sent a copy of the transcript, which you can revise for any minor errors. This session is on the record. It is being webcast live and will subsequently be accessible via the parliamentary website. You are welcome—indeed you are absolutely encouraged—to submit any useful supplementary evidence after this session. So, if we do not get through everything properly or there are things left hanging where you think you could send us some extra information, that would be great. I am asked to remind everybody to speak up clearly. The acoustics are not bad in here but it is good to keep your voices up. That is by way of an opening.

I will ask you to introduce yourselves one by one. If you wish to make any opening remarks, you are very welcome to do so, otherwise we will go straight into the questions. Obviously there are four of you on the panel, so we will not expect you all to answer all the questions. Some of them are more relevant to one or more of you, while some may be relevant to all of you. We will play it by ear slightly. Dr Mitchell.

**Dr Bill Mitchell:** My name is Bill Mitchell. I am director of education at BCS, the professional body for IT. We have about 75,000 members and a royal charter that says we exist to advance computing for the benefit of the public. We work in collaboration with the Computing At School group—which my colleague, Simon Peyton Jones chairs—and we do a

whole range of things, working from primary school through to university level, where we accredit computer science degree courses in about 95 universities around the UK.

**Professor Simon Peyton Jones:** I am Simon Peyton Jones. I am a professional computer science researcher. I work at the Microsoft Research lab in Cambridge, but the reason I am here is because I am chair of the Computing At School group that Bill referred to, which is now part of BCS. This started around 2007 or 2008, with the single mission of reforming the ICT curriculum, as then was. We began to understand that what we wanted to do was to establish computer science as a foundational discipline that every child should study—just as they study maths, science or natural science—from primary school onwards. So it was a very big shift in perception.

Rather to our surprise, it was entirely successful and the new national curriculum embodies exactly this idea from primary school onwards. CAS's new mission is now simply to support, encourage and equip our existing teachers and new teachers to be able to deliver that curriculum with confidence and enthusiasm. That is what we are trying to do.

**The Chairman:** That is very straightforward.

**Professor Simon Peyton Jones:** Totally one mission. Not all that easy to achieve.

**The Chairman:** Thank you very much. Mr Taylor.

**Charlie Taylor:** My name is Charlie Taylor. I am chief executive of the National College for Teaching and Leadership. We have responsibility for allocating teacher training places across the country and for national recruitment of teachers against the teacher supply model every year.

**Sir Andrew Carter:** Andrew Carter. I am a head teacher of a primary school in Surrey and am also conducting a review into an issue of teacher training at the moment. I am on the Teaching Schools Council board and a member of the regional commissioners' board.

**Baroness O'Cathain:** I just wanted to refer to Professor Simon Peyton Jones's statement about the curriculum. Last week, we had evidence to the effect that it was great in primary schools but then—to use an expression—they fall off a cliff, because as soon as they get to the secondary school level, or a more senior level, they are left completely without any direction. I think it is very important that you tell us whether that is the case, because we gasped at that. It is completely contradictory to what you have said.

**Professor Simon Peyton Jones:** Were they referring to the past ICT curriculum as was, or the new one as introduced?

**The Chairman:** I think the point they were making—and in a sense we will probably cover it in more detail going forward—was that they felt there was an enthusiasm in the primary sector and that there was a chance of having a pretty universal delivery in the future in the primary sector, but that it was much more patchy, and a minority not a majority position, in the secondary sector.

**Professor Simon Peyton Jones:** No, I do not agree with that at all. The CAS working group started in secondary, if anything. By and large, secondary teachers are enthusiastic about the change. I perceive ICT teachers in the past as having been rather low-status or low in the pecking order of school teachers. The whole ethos of the new curriculum is to re-establish them as high-status, like science and maths teachers, and as doing a job where they could get a highly paid job in industry instead. Broadly, teachers are keen about the direction of

travel. I do not have data on this but I have talked to a lot of teachers. But I think many of them feel underequipped to deliver that change in a short time. Essentially, we are asking them to do something that they have never been asked to do before, which is to teach an entirely new subject, both at primary and secondary level.

But teachers are good at learning. I have seen them stand up in a room and say, “We are teachers. We can learn”. If we provide them with enough support, enthusiasm and time to do the subject knowledge enhancement themselves, they will be just fine.

**Q144 The Chairman:** Let me pick up on that and move to the main questions. I will kick off with the first one. We know that an awful lot of teachers who are going to be teaching computing going forward do not have any formal qualifications to do that and have never taught computer science before. Can all of you—in different ways—help us understand how the current teaching workforce is preparing for the new curriculum? To what extent is it true that the new curriculum is not yet being delivered? How patchy is it and, therefore, what needs to change going forward in order to enable good teaching to happen across the country rather than with enthusiasts, in a sense? Perhaps I can start with Dr Mitchell.

**Dr Bill Mitchell:** We helped put together the new curriculum with the Computing At School group. We always took the view that 1 September is not the day that 20,000-odd schools are going to be good at teaching computing, but the day on which 20,000-odd schools are going to wake up and think, “Right, how do we become good at teaching computing?”. We have always felt that the most important thing is to make sure that teachers have the right support so that over the coming years—and it will be years—they will eventually get to the place where they are good at teaching computing.

We believe the most important thing is creating communities of professional practice, where teachers from different schools can get together and collaborate with each other to figure out what good and best practice looks like. In terms of whether they are prepared or not, for us the most important thing is whether or not they are taking part in those local networks where they talk to other teachers and start to learn about how to teach computing. It is particularly important as well that they can get in touch with their local universities because now, with the new curriculum, just about every computer science department in the country is chomping at the bit to get in and help schools. In the past it was certainly the case that a lot of computer science departments at universities regarded ICT with disdain and were not terribly interested in it. Many of them had the view that they would rather it was not there at all. Whereas now, with the new computing curriculum, there is a huge amount of goodwill and support from those universities.

If we look at the Computing At School group, we surveyed about 2,000 of the teachers there in March and about three-quarters of them felt that if they were part of an active local community, they were doing fine. That was the key thing.

**The Chairman:** If they were?

**Dr Bill Mitchell:** If they were. Those that did not have that local community of support seemed to feel that they were a bit out on a limb.

**The Chairman:** Can you give us a picture at the moment of how many would be? That is the key. To give you a bit of context, we have heard lots of evidence of lots of enthusiasm and lots of good initiatives, whether it is Code Club or whatever, but our perception is that it is not sufficiently joined up in terms of the thing moving forward at the moment. I suppose

one of the things we are interested in is how many teachers, roughly, and what proportion would now be involved in some sort of local group. What is the timescale over which that could happen and how will it happen?

**Dr Bill Mitchell:** The Computing At School group runs about 110 hubs or local groups around the country. That means that something like 90% of the teachers in CAS—which is about 15,000 or so—are within about half an hour's drive from a hub. Half an hour's drive is quite a long way, so ideally you might have 300 or so CAS hubs if you want to make sure that teachers are only 10 minutes away from the nearest hub.

On that sort of basis, I would say that perhaps one-third of teachers have easy access to a local community where they can talk to their other teachers and get help, which suggests that the other two-thirds do not have that easy access.

**The Chairman:** That gives us a picture at the moment. Lord Kirkwood wanted to come in quickly.

**Lord Kirkwood of Kirkhope:** Very briefly. As these regional differences emerge, are there things that we should be looking to deal with that? In particular, are there national differences? I am interested in knowing to what extent Scotland, Wales and Northern Ireland are embracing the work you have done. How much communication is there between you and your professional colleagues in other parts of the United Kingdom?

**Dr Bill Mitchell:** The Computing At School group goes right across the UK, so we do a lot of work in Scotland. In the same way that, in the UK, CAS is helping to train master teachers, there is a similar scheme in Scotland that is funded by the Scottish Government to develop what they call lead practitioners. There is a lot of similarity between the support that CAS is trying to provide to teachers in England and in Scotland.

In Wales, it is a very different situation because there is still a lot of debate about whether they need to change the ICT curriculum and, if they do, in what way. In Northern Ireland, there is a desperate shortage of teachers who can teach computing, so they have a huge problem there.

**Professor Simon Peyton Jones:** I think it is worth just putting a little context around this patchiness. In the olden days, when the DfE put in a new curriculum for something, as they did in ICT 15 years ago, they would have rolled out a big national training programme—indeed they did one called the National Strategy for ICT, which Charlie and I were talking about just before this. It was a big top-down training programme. The approach this time is entirely different and amounts to a bit of an experiment. The DfE and NCTL are consciously standing back from the process of training teachers and inviting the tech sector—the professional bodies and companies—and teachers themselves, particularly in teaching school alliances, to come forward and lead the process of training and equipping teachers to deliver the new curriculum.

That is innovative, diverse and creative; but it is also quite likely to be patchy. It is very difficult to guarantee the kind of uniformity of provision, regionally and across schools, that you might if you had big central provision. You may want to elaborate on that, Charlie, because this is more your bailiwick than mine.

**Charlie Taylor:** Simon is absolutely right. What we would have done in the past is the old style “sheep dip” of teachers and we would have said, “Right, here is the new curriculum. We will book hotels around the country and even perhaps give an extra day's inset training,

and we will deliver this training”. However, particularly with something like computer science, which is such a fast moving subject, to just have a point in time at which everybody is trained would not solve the problem because this is about ongoing training and support. We cannot even know yet what stuff people are going to be teaching in schools in a couple of years’ time, because some of it may not have even been invented.

So there is a process here of innovation and inventiveness rather than simply saying, “Here is the new curriculum, off you go and get on with it”. The new national curriculum is deliberately short—very short—so that there is lots of scope for doing it in different ways and to be innovative about the way that it is delivered.

**Q145 The Chairman:** I will ask you a supplementary on that. I understand that, but what about when you end up mapping the thing and you find that half the country is not covered and does not have teaching schools operating. What role will the national structure then have to move that on, at least to get everybody to the current acceptable level? I take your point about going forward.

**Charlie Taylor:** You are absolutely right. One of the things that is a crucial player in this—Andrew will say probably more about this—is the development of teaching school networks. One of the things that we are particularly focusing on in the National College is about encouraging more teaching schools to step up in areas of the country where there are not the levels of teaching schools that we need in order to get these networks of support to develop. In the last round of teaching schools, we designated 60, half of which came from places like Norfolk, Suffolk, parts of the east coast and Lincolnshire, where we do not have enough teaching schools. So there is a real push from us in terms of being able to do that.

We will continue to monitor and look at parts of the country and if we think there is an emerging problem, we will consider that and think again about what more we need to do in order to support them. But it is very much about what the Government can do to support teaching schools, or indeed the people like the BCS, to reach out and to support people. It is not just about us saying, “This is how you need to do it”.

**Lord Haskel:** Do you have any part to play in teacher training of current teachers?

**Charlie Taylor:** Is that for me?

**Lord Haskel:** Yes.

**Charlie Taylor:** Our role at the National College is to allocate teacher training places out, either to universities or to schools through the school direct programme. Our other role is to support nationally with recruitment. I hope you will have seen our new “Your future their future” recruitment campaign—I am trying to recruit here—to encourage more people to come into teaching. So we have an overview of initial teacher training but we are not involved in the specific delivery.

**Sir Andrew Carter:** We have to recognise that there is an enormous capacity in schools for change. In the last 20 years, we have been through many aspects of the national curriculum and we have been through strategies. Schools have become very adaptable and good at it and have changed structures in them. This is a worry, but I do not think we should worry too much about it.

We also need to look at some of the mechanisms by which change is brought about in schools. One is Ofsted. Anything that goes into an Ofsted schedule gets done quite quickly,

clearly, because there are penalties that go with it and also honour that goes with it, I suppose. We need to make sure that Ofsted is trained in the new national curriculum, because the worst thing that could happen now is that a school falls over because of an Ofsted inspector who does not understand what is happening. I am not blaming people; it is just that there is a lot for them to learn as well.

Teaching school alliances are absolutely crucial to this. They are the biggest single mechanism in the country for getting something into schools. Even though the coverage is not there, already 99% of schools are in teaching school alliances. Those alliances are very active, with strong schools at the centre. If you want to get something into a school tomorrow, if you e-mail it to a teaching school today it will be in a school tomorrow and acted upon because there is a local need and local support there. Certainly in the schools I work in—I work in the primary sector—people are working very, very hard at this. I hate to mention the funding, but there is also an issue there. It is not that people need large amounts of money, but there are physical things that have to be bought that can, therefore, stop it going forward a little bit.

**The Chairman:** Just explain that a bit, because often it is not very much that makes a difference.

**Sir Andrew Carter:** No, it is not very much. Contrary to quite a lot of common belief, we are not after lots of money but this seed funding to make things happen. I was around in teaching when computers came in. The way it started was every school was given one BBC computer—just one. That was all that happened, and then the whole thing happened and we are where we are today, talking about this wonderful new world. So a small amount of money needs to go into every school but with the imperative to do it. The people clearly have the imperative because the national curriculum started in September and it will be inspected at your next inspection. It is very clear in schools; I do not know any school that is not working seriously towards this now.

Could I give you another suggestion? In the same way that we have a champion or a person who is totally responsible for special needs, it would be very useful if there was one person in every school responsible for IT.

**The Chairman:** On that point, one of the things that we will ask before you leave is, “Give us one idea”. That may be your one idea because we want to focus very clearly on a set of deliverables.

**Q146 Lord Giddens:** I will turn to a point that was raised briefly which I have been struggling with ever since we started this inquiry. How do you deal with education in a world of massively shifting skills? We do not have stable skills, or it is difficult to discern what they are. We are using iPads and iPads will probably not exist 10 years from now, I would guess. Skills are created but they are also destroyed, because computers can now do lots of things that human beings did before. I was in universities where you do not see what happens in schools, but how do you deal with that? You mentioned an obvious answer: teach creativity. But what the hell is creativity? How do you think teachers and children should best deal with such a mobile situation?

**The Chairman:** Professor Peyton Jones looks very keen to answer.

**Professor Simon Peyton Jones:** That is an excellent question, and I think there is a good answer to it. I think what happened in our ICT curriculum, as was, was that we had become

very focused on skills in using technology. Your implication, in mentioning iPads and so forth, is that technology changes very rapidly and the skills in using technology rapidly become out of date. So what do we do in the rest of our educational provision? We do not teach children a lot about how to use particular bandsaws or particular sewing machines. We teach them subject disciplines, like maths or science or history or geography. These do not change fast. Newton's laws of motion have not changed a lot in the last 400 years, relativity notwithstanding.

Subject disciplines are less immediately applicable than skills, but they are very long lasting. In this particular area that we are talking about today, what the new curriculum strives to do is to move the focus from technology to ideas, so that we can equip children with some knowledge of the underlying subject discipline—which happens to be called computer science—which will last them their whole lives and not just the life of the next iPad. That very same subject discipline, knowledge, methods, tools, techniques is then useful to them as they encounter successive waves of technology. They can make some kind of sense of it.

**Lord Giddens:** Can you give a concrete example? It might help.

**Professor Simon Peyton Jones:** Sure. Let me take the one that is closest to the surface of most people's perception about the new curriculum, programming. Say I have written programs—perhaps in more than one language so that I know that it is not a magic incantation you utter in java—and I have the idea of what it means to write a program. So when I come across a new programming language or indeed a new computer, then instead of it being a completely magic entity that was built by somebody else and is not under my control at all, suddenly I think of it as something that someone built and someone like me could perhaps modify. That may be something as simple as writing the rules for your e-mail filtering—which is a tiny program—or writing an Excel spreadsheet, or perhaps becoming a software engineer. It is kind of like a sense of empowerment about the technology rather than it being supplied as a form of magic by somebody else.

**Q147 Lord Macdonald of Tradeston:** A very basic question, perhaps for Sir Andrew. I am not clear at all when you look for the basic tools and infrastructure, which you need more money for, whether the children are encouraged to bring their own technology into the schools. Do they bring in iPads and so on? If it is rapidly changing, is it for the pupils and their families to keep up with that while you provide a basic infrastructure that they plug in to?

**Sir Andrew Carter:** The challenge around that is that you get this social divide then, and that is always difficult. So, no, they do not bring them yet. I am absolutely convinced they will in the future. In the same way we all took in a protractor years ago, they will be taking those in as well. However, what we do want to make sure is that when they come into school, there are iPads. There need to be iPads for every child. But to do that would be a huge investment. I guess that we have to come to a position in society about whether we make that a mandatory thing and whether, therefore, we give that extra support for children on the pupil premium. It is quite difficult. At this moment now, what we need to have is at least a set of iPads in every primary school. That would change the world.

**The Chairman:** You could do one class. They could use them class by class in the same way you used to have computers.



**Sir Andrew Carter:** Yes. That would be a tremendous start. We are realistic; we are not going to give one iPad to every child in the country. Many schools do, but of course it is at the expense of something else.

**The Chairman:** It is not super-efficient. Mr Taylor, you want to come in.

**Charlie Taylor:** I was just going to say on that what is very interesting about children bringing technology in is the sort of argument over mobile phones. You have some schools who say, "We must never see mobile phones. These are a terrible threat to discipline within the school". Other schools use mobile phones a lot. I was in a technology class the other day and the teacher said, "Right, end of the lesson, everybody take a picture of their work please, stick it up on their Myspace and I will have a look at it later on this evening". So it was absolutely just dyed in the wool that it was absolutely part of the way that that school did business.

So there is a big sort of spectrum in terms of the way that schools have the confidence to interact with technology. It also depends on the type of school and the type of pupils and whether they have the self-discipline, or the school has engendered the self-discipline, to be able to use technology in a sensible and useful way.

**The Chairman:** Can I just ask you what sort of school that was? To what extent is there a danger—

**Charlie Taylor:** It was a school that required improvement in Kettering, so this was no leafy sort of—

**The Chairman:** Right, because obviously one of the things we keep hearing—as you have just alluded to—is the danger of a larger social divide.

**Charlie Taylor:** Indeed, but a phone with a camera is pretty ubiquitous now.

**The Chairman:** Yes, it is everywhere.

**Charlie Taylor:** It is quite hard to buy one without one.

**The Chairman:** Thank you. Let us move on. Lady Garden, over to you.

**Q148 Baroness Garden of Frognal:** You have touched on this but can I focus you on the initial teacher training package. Are newly recruited teachers being trained effectively? Who ultimately has the responsibility for training the trainers when you get, effectively, a new curriculum subject like this?

**Charlie Taylor:** Shall I take that? When the new computer curriculum was on the horizon we convened expert groups in order to get together and disseminate resources, because obviously this was a shift for the ITT computing departments of universities. Expert groups got together in order to disseminate materials to say, "Look, here are the sorts of things that we think are going to be useful in terms of delivering the new curriculum". So that was the work that we did in training the trainers within the universities and the school-centred initial teacher training.

**Baroness Garden of Frognal:** That would apply to new recruits as well as to existing teachers, would it? Is there some overlap between the two?

**Charlie Taylor:** That was the trainers, so the people who were going to be delivering the training. That was the first stage in terms of preparing them to be able to train trainees for the new curriculum.

**The Chairman:** To what extent is this being picked up across the piece? One of the other things that various people have suggested to us is that, rather than it just being the case for specialists working in this area, the whole aspect of computer skills in general, not just in teaching but across the piece, needs to be everywhere and needs to be much more universal. Yes, it needs specialisms but also to be much more universal. To what extent is it coming into general teacher training for everybody as well as obviously the specialist people that Professor Peyton Jones is talking about?

**Charlie Taylor:** When one is thinking about teacher training, we need to move on from just thinking about it as something that goes on for a year. There is a limit to the amount that people can absorb, as well as having to teach the new computing curriculum, particularly in primary. They have to teach maths, science and all the other aspects. I do not see this as just about initial teacher training; I see this as teacher training across the board, from when they start to when they retire much further on. Therefore, it needs to be an iterative process that goes on through people's career rather than just saying, "If we frontload everything in, in the first year of teacher training, that will be enough". It simply will not be enough, particularly in a fast moving subject like computing.

**The Chairman:** I take that point. But you said in your introductions, "This needs to be seen alongside English, maths and science". They are taught in the initial teacher training so should this not be, at least at some level, across the piece in the initial teacher training?

**Charlie Taylor:** Part of the process of teacher training is you have to meet the qualified teacher standards. Part of the qualified teacher standards is having sufficient subject knowledge to be able to teach those subjects.

**Sir Andrew Carter:** I am conducting a review of initial teacher training for the Government at the moment so I am steeped in what is going on. The answer is that there is not enough subject knowledge in this at the moment. However, there is an awareness that there should be. What is happening is that schools are in advance now of teacher training because they have to do it because it is live in their school. We are certainly going to make some recommendations around this subject knowledge area.

The way that can be best done is if teachers are taught in a school-based route but using HEIs, higher education institutes, to support a lot of that subject knowledge; not just computing, although that is what we are referring to today because it does have to be there. A lot of people believe they know about computing but of course, as we know, they know about how to use them rather than what we are talking about now. I do not think it is going to be too complicated to get to the level of understanding that people will need, certainly at the primary level, but more technical later on perhaps.

**Professor Simon Peyton Jones:** There are two separate conversations going on here. One is about training teachers to teach the new national curriculum subject, called computing. Another is about training teachers in the pedagogy of using digital technology to support teaching and learning across every subject, so you become a better history teacher or geography teacher. They are not unrelated, but they are absolutely not the same. We are still learning how to use, say, ubiquitous tablet technology in schools to improve teaching

and learning across the whole piece. We do not have answers to that yet. The school where I am chair of governors has introduced one-to-one tablets recently and there is a lot of innovation going on there, which should eventually migrate into teacher training itself. But that is separate from how we make sure there is an adequate supply of computing teachers. Let us not forget that computing teachers are not just about teaching the computer science bit; the computing curriculum covers existing ICT provision, which is still very important.

**Baroness O’Cathain:** Surely that means that there is a third tier on top of the two that you said, which is making sure that there is a cadre of people who are always at the leading edge of computer science. They in turn will be taking your part and directing what people will do. You train teachers to teach but you also need people who can do their own research on issues like that and get close to the scientists—some of them would even be scientists from university. Otherwise they are going to be stuck in a groove of teaching the same sort of thing.

**Professor Simon Peyton Jones:** That is true of every subject, is it not?

**Baroness O’Cathain:** Yes.

**Professor Simon Peyton Jones:** We need constant refreshing of the content and the way of delivering it.

**Q149 Lord Holmes of Richmond:** Good morning. I would like to turn to the question of incentives. Do you think more incentives are required to increase teacher applicants to these subject areas, perhaps increased salaries and things of that nature?

**Charlie Taylor:** There are three things there. The first thing that we introduced is bursary payments to teachers in order to encourage them to come into the profession, and computer science is one of our absolute priority areas. We know we need to get more people coming into computer science, and there is a very competitive market out there: good-quality graduates are in short supply and high demand. Therefore, this year we have increased the bursaries that we are paying out for computer science. If you have a First or a PhD, you can get a tax-free bursary of £25,000 in order to support you through your training year. That is the first thing.

The second thing is the scholarship scheme that we have introduced with BCS, which has been an innovative way of both increasing the supply of people coming in but also increasing the status of computing and of the teaching of computing, working with an eminent group like BCS but also other groups, such as Google and Microsoft, which are supporting the programme. That has meant we have been able to encourage and raise the status of it.

Finally, there are subject knowledge enhancement courses. They are run by universities, or within schools, but we provide the funding for them—I think £350,000 last year. These are for people who perhaps do not have a degree in computer science but, for example, have many of the skills that would be required. What the subject knowledge enhancement course does—we do it for physics and maths as well—is to help them to move to a place where they are confident enough to be able to start teacher training and then to deliver the new subject. I think those are probably the three ways. Bill may want to say more about the scholarships.

**The Chairman:** Could you just tell us—I do not know whether it is you, Mr Taylor, or Dr Bill Mitchell—how many people get those bursaries? Are they for secondary and primary or just secondary?

**Charlie Taylor:** These are for specialist computing teachers, so secondary teachers. There is a different bursary scheme for payments to primary. We know that 70% of people who came in to computer science last year got at least a 2.1, and even for a 2.2 we provide a bursary of £15,000. There will be very few people who would not have received a bursary for computer science, and we have increased it this year.

**The Chairman:** How many people take the bursary up?

**Charlie Taylor:** Everybody who goes on the teacher training course gets the bursary as part of the process.

**The Chairman:** Yes, but how many is that? What I am asking is: how many new teachers are coming in to the profession to help deliver this curriculum?

**Charlie Taylor:** Last year 360 came into the profession, which was only 57% of our target; so last year was very concerning. The final numbers are not out yet but there is at least a 50% increase and we think we will be around about 90%, or probably just below 90%, of our target this year. So it is not as good as it should be but we think there is a big change.

The other encouraging thing is the number of people who register an interest on our website in becoming a teacher. We have seen registrations double in the last year for people wanting to do computer science. Particularly with the work of people, like Bill and Simon, this is a subject that has been invigorated and made more interesting and more exciting. I think there is a momentum beginning to build around it, although it is a challenging recruitment environment and we are in no way complacent. That is why we have increased the bursaries.

**The Chairman:** Dr Mitchell, do you want to add to that?

**Dr Bill Mitchell:** The number of scholarships that were awarded this year, 2013-14, was 121. There were about 400 applicants, and the vast majority of those had at least a 2.1 or First Class honours degree. It is very encouraging. What is also encouraging of course is that all of those people who had a 2.1 or a First Class honours degree would automatically be offered a bursary, and the vast majority of those did go on to a teacher training course.

What is nice about having something like the scholarship scheme is it gives an extra kudos and cachet to people applying to train as computer science teachers, because it is backed by companies such as Microsoft, Google, Facebook, BT, IBM, HP—all of those huge companies. So teachers that go through that scholarship scheme feel as if they are actually being endorsed by these large companies. It gives a huge boost to their confidence.

**The Chairman:** What about the primary sector?

**Sir Andrew Carter:** As I mentioned, I think that we ought to try to create a teaching and learning responsibility in every primary school for ITT which would attract finance. But there is a bigger incentive in teaching: teachers are often driven by some very different motives, and it is about status. In a school, leading this new initiative stands as a very high-status job within the profession. There should be strong links, but I do not think the commercial world is as good at this as it should be—it should be linking with every school, so that when you become involved in computing in a primary school you are linked with someone who is in the commercial world. I know it would be difficult to do that but we could do much more of

it. The commercial sector does not get involved in the primary world, because they go nearer to where the people will be entering the workforce.

**Dr Bill Mitchell:** One of the things we are finding—it is not hard data, it is qualitative data—is that where primary schools are taking an interest in introducing innovative and exciting computing, they have found that a lot of their children are improving their literacy and their numeracy skills. If that message is indeed true—it would be great to have some solid research done on that—and if that message then got to head teachers in primary schools, that would hugely increase their interest in wanting to teach computing.

**Q150 Lord Janvrin:** I will take you back to an area that we have touched on. Mr Taylor, you mentioned the iterative process through a teaching career, and the whole question of continuing professional development and how we deliver that. Is it through these local professional networks? What role does higher education have in that process? In particular, there is this point that we have just touched on: where does industry get involved? How can it get involved in changing the culture of lifelong learning within the teaching profession? There is the wider world, too, but we are focusing on the teaching profession.

**Sir Andrew Carter:** As I have been looking at initial teacher training, one of the things we have been very clear on is that it is initial teacher training and, therefore, we must understand that teachers will need to go on training—we could say for ever, but certainly for up to five years, we would expect there to be a systematic approach to that. The higher education institutions get involved through having a lot of expertise, and they ought to be working in partnerships with schools. The error is that they should not be leading it; the lead should come from the schools. But absolutely, we should use the HEIs and their expertise, because it is schools where the hard action is taking place and where the real issues lie. With industry, it is very difficult. I mentioned earlier that they do not tend to get involved with younger people. There is a lot of evidence to show that the bank your parents bank with is the one you tend to bank with yourself. Let us get a message the other way, so that the commercial world understands that those early links are often the ones that stay with children right through into later life when they might want a job too.

The thing about CPD is that CPD is funded by schools. There is no additional funding for CPD—again, I am not making a plea for money because I understand the world as it is—but if a teacher goes out on a course and it costs £150 for the course, the reality is it costs the school another £200 to pay for a supply teacher, and the supply teacher will not necessarily be as good for that class, because you cannot find teachers. So there has to be a bit of an incentive package around that. That is where working with alliances and groups of schools together can be enormously cost effective and enormously helpful. Again, Microsoft cannot go everywhere, but there are companies that could support schools enormously and could reach out. There ought even to be somebody from a technological firm on the governing body of every school.

**Q151 The Chairman:** That is quite optimistic. The Committee has been struggling with how you move from ad hoc good practice. There is certainly lots of ad hoc good practice, including industry links. We have had Microsoft and Google in front of us, as you can imagine, and they are doing some great stuff, but it is pretty localised, I have to say. It is rather the same favoured regions or sub-regions getting all the attention, and any insights you can give us on how it can spread from pockets would be very helpful or any

recommendations, because we are not getting good advice on that. Do you want to come back on it?

**Lord Janvrin:** Who creates these local networks? The local schools?

**Sir Andrew Carter:** Teaching schools. Teaching schools are the ideal vehicle for that because they are there, they are established and they have taken on that role.

**Lord Janvrin:** Is it up to them as to whether they are creating this?

**Sir Andrew Carter:** Let me give you an example. With the rollout of the new national curriculum, teaching schools were asked to bid for £10,000—not for them but for their alliance of schools—and they then produced large parts of the training that went round it. As Charlie said, the old national strategies were fine but it was very difficult to find a national strategy because it tended to be a little bit too prescriptive. Local people could find their local solutions. The other thing is that, even if they find out the solution that everybody else has found, it is much more meaningful because they have worked it out for themselves.

**Lord Giddens:** I just want to ask briefly about something that also preoccupies me. How far are these technologies going to change actual nature of teaching itself? Because in many areas they imply a participatory model, not a straightforward didactic model, and we all have experience of learning from our children about using digital technologies. Do you think the structure of teaching is going to become more open and more participatory?

**The Chairman:** Mr Taylor has a mantra, I think, on this.

**Charlie Taylor:** It is going to be one of the most fascinating things that will develop in the next few years.

**Lord Giddens:** It is going to be a true revolution.

**Charlie Taylor:** I agree. However, the most important thing here is that we continue to look at the evidence for what works. It is important that we do not just plunge in with the latest bright idea until we have looked at—it is a financial commitment—what evidence there is showing that this way of teaching is an effective one? One of the things that has been interesting, again, about the work of teaching schools that have remit for research and also for things like researchED or for the Education Endowment Foundation, and also for universities, is looking at what things really work in terms of ICT. I do not see ICT as the solution to all problems but I do think that improved computing skills, improved ICT, will help us to solve some problems. But we need the research to back that up.

**Sir Andrew Carter:** I think it is going to make a change. We have a problem across recruitment, and I believe what will happen—many schools are already doing this—is larger classes. This is not a way of doing it more cheaply but having one trained teacher with a number of para-professionals—teaching assistants and people with different levels of skills— and technology can be hugely beneficial.

For instance, if you look now no child can ever leave their homework at home any longer because, of course, they go home and there it is sitting on the net waiting, and it can be sent. The way we look at this is changing. The use of whiteboards in classrooms is not a blackboard by another name. There are other things, but it takes time for that to happen, although it is happening quite dramatically. I just come back to Ofsted because Ofsted needs to also reflect that change as well.

**The Chairman:** Can I just ask just one additional question on this? Is the national curriculum being delivered in all schools whether they are academies or not?

**Sir Andrew Carter:** Yes.

**The Chairman:** So they are ignoring the fact they do not have to, they are doing it?

**Sir Andrew Carter:** You do not have to but you are Ofsteded in the same way, so you do have to.

**Q152 Lord Aberdare:** Can I pick up the question of the involvement of industry? From both sides, how can teachers gain more experience of the reality of working life and how can industry be brought on board? I also have one little supplementary. We have heard absolutely nothing good about the current state of careers advice. Is there a role for industry in that? We have heard nothing good but what we have not heard is what solutions are being come up with. I am not sure who I am addressing that to.

**Charlie Taylor:** Shall I take careers advice and you take industry advice? Nicky Morgan, the new Secretary of State, is very keen to look at what we can do in order to improve the quality of careers advice within schools. It is work in progress and something she is very keen to push, so we can expect more in the next few months.

**Professor Simon Peyton Jones:** There are quite a lot of opportunities for people in companies to become involved these days. One of the quite liberating strengths of this new rather bottom-up, decentralised training programme is that it leaves the field open for companies to become involved. CAS certainly has been very active in trying to talk to companies to say, "You should not just stand on the sidelines and say nice things but get involved". When it comes to "getting involved", you know of Code Club, for example.

**The Chairman:** We have had them here, yes.

**Professor Simon Peyton Jones:** So there are quite a lot of volunteers from companies who are involved in that.

**The Chairman:** I have to say that is one of the things that has concerned us when they were here. They were brilliant, but they were very small.

**Professor Simon Peyton Jones:** There are perhaps a couple of thousand of them.

**The Chairman:** Yes, only in primaries.

**Professor Simon Peyton Jones:** Yes, Code Club is focused on primary.

**The Chairman:** But struggling to get industry.

**Professor Simon Peyton Jones:** Yes—

**The Chairman:** I suppose that has fed our concern about how we make this happen in a joined-up way, not just in the good areas where they already have contacts. Sorry to have interrupted you.

**Professor Simon Peyton Jones:** I think it is because it went from zero to 1,500 after-school clubs in about two years, which is quite a remarkable change. Those are actual volunteers. About half of them are run by teachers but half of them are run by volunteers from industry. It is an example of something that did work. Speculatively, I would love to see people from companies partnering a bit more actively with school teachers, if not in the classroom then

at least after class; not just running ancillary clubs, but part of the curriculum. But I do not think we have any good models for doing that at the moment. It is not something CAS has done particularly well thus far.

One innovative idea that the DfE ran recently was to offer matched funding for work to support the computing curriculum. They said, “If you put a pound on the table we will match it with a pound”, which unlocked £500,000 of investment from companies, mainly, and other donors to directly support the computer curriculum. I would love to see that repeated because it is not only that it is cost effective—a pound the Government is going to get matched—but because nobody gives you £100,000 without becoming involved in a visceral way. So it is a good model. I would like to see it happen again please.

**Q153 Lord Macdonald of Tradeston:** You will get 2,000 out of 20,000, perhaps 10%. We were told the target was 50% by 2018, which is much too slow. Should we not be old fashioned and go back to a central command economy that says, “There is going to be money for Code Clubs, and every primary school should have one within the next year or two. You go out and find it in the community, and we will match it”? Should there perhaps not be that top-down, centralised instruction?

**Dr Bill Mitchell:** With trying to get industry to help with after-school clubs, the bigger question is getting the volunteers rather than the funding, because for the schools the cost is almost zero. The volunteers are very enthusiastic about it if they do it—you want a volunteer who is very enthusiastic—so simply providing money for it certainly would probably help, but it would not necessarily provide the volunteers.

One of the things I wanted to mention a moment ago is there is a scheme called the master teacher training programme, which is funded by the Department for Education. The idea of a master teacher is that a practising teacher who is, according to Ofsted, outstanding is paired with a local university and provides CPD for their local schools. That person, that master teacher, could be an ideal person to help with careers advice, in my opinion. There will be around 400 of them by the end of March next year, more or less, and it is perfectly possible for industry to be able to provide those 400 master teachers with the support so that they can do an effective job of providing careers advice. Whereas what you could not do is expect industry to support the goodness knows how many teachers there are in schools on a one-to-one basis. My own recommendation would be to see if there are ways of using that master teacher network to support careers advice through schools. Last year they helped more than 15,000 teachers so they are quite effective.

**The Chairman:** Mr Taylor, do you want to come in on Lord Macdonald’s point?

**Charlie Taylor:** I take your point about the idea of a top-down approach. The risk is around quality. We have to make sure that we have the right people going into schools, and the risk of saying, “Right, here is the money, let us get people in” is that people who come in from industry have to be people who can engage with children, build relationships and do the job. Therefore, building it gradually over time and encouraging more people to become part of what is a burgeoning movement is less risky than simply saying this has to happen. The danger, or potential risk, is that you get people paying lip service and thinking that we have to get someone in, but that it does not matter who it is, in order to tick the box and get the funding. That is the counter-risk against the more top-down way of doing it.



**The Chairman:** Do you think there is an in-between role, where there is a need for a more strategic overview at least of how things are going and better mapping of how things are going? When Code Club gave evidence and we asked, “How are you going to spread your impact? How are you going to roll out?”, they said, “We do not know”. They were great, and they were enthusiastic, but in all frankness we did not get any view that they were part of a strategy about becoming national.

**Professor Simon Peyton Jones:** That is the thing about these bottom-up volunteer groups. CAS is mainly a grass-roots volunteer movement and is straining every nerve to do whatever possible to support the new curriculum. It is a bit like walking into a room of starving people with a basket of bread; it is very rapidly used up and it is difficult to make sure it is distributed in a completely fair way. But I do think there is perhaps a role for NCTL and the DfE to stand back a bit and say, “Given all this patchy volunteer provision, where are the gaps?”. I am not sure we have a good story on doing that at the moment.

**The Chairman:** That is what we are collectively asking.

**Professor Simon Peyton Jones:** I do not think we have a mechanism for doing that, do we? Perhaps we do.

**Charlie Taylor:** One thing, for example, is one might look at something like an Ofsted thematic inspection of computing within primary schools. That would be the sort of thing that could happen in a year or two’s time: to say, “Okay, how well do we think this is bedded down?”. Also there is the Ofsted framework as well, in which schools are held to account for the quality of teaching, which is going on in there as well. There is an assurance mechanism there too.

**The Chairman:** Except they do not look at individual subjects, do they? Let us be honest.

**Charlie Taylor:** Yes, but they look at the quality of teaching every year.

**Q154 Lord Kirkwood of Kirkhope:** This is very important for us because sitting on this side of the table you will understand that it is much safer for politicians to say, “We will deliver standards, across the country. No one will be left behind”. That is the press release, and the dogs bark and the caravans move on. There must be a middle way somewhere. I would like you to go away and maybe send us a page of A4 about it, because I think the idea of letting a thousand flowers bloom is very attractive, and your argument is nearly persuading me, but as a practising politician it is very hard to say let the best thrive and let the devil take the hindmost. If this Committee is to come up with a recommendation, it would be very brave of us to say, “Just let it all hang out”. Could somebody give us a note about what a middle course, as suggested by the chair, might look like because that is where I would like to come out on this?

**The Chairman:** Sir Andrew, when is your report?

**Sir Andrew Carter:** The only place where this all happens is in a school, every day. At the moment, while we are discussing it, teachers are doing it. That is where the action should be. Here is a very practical thing and I am not saying this is any clever way. This time last year we had not decided about free school meals for children under seven. It was decided, and today everybody is eating them. That happened and it was without a lot of fuss, to be absolutely honest. If you go to schools, they will deliver, if it is a requirement. Now, if it is a reasonable requirement, give £100 to every school for a computing curriculum—it could be

£200 or £500, but let us be realistic and say £100. That looks to be about £70 million, I think—I do not know. But you give £100 and then put some very strict rules on what has to be delivered at the end of that. It may not be this particular Code Club, because Code Club may not be able to do it, but something like that. If you have very clear parameters and it is in the national curriculum, I am absolutely convinced schools will deliver it.

**Charlie Taylor:** Just very briefly on that. To some extent we have a middle way, which is around teaching schools. We have 500 at the moment; we are looking to expand to 600. These are funded by central government and have a remit about the things they should do.

**Lord Kirkwood of Kirkhope:** Across the UK?

**Charlie Taylor:** Across England.

**The Chairman:** I think we need a map of where they are and where they are not, because it does slightly go to our point of patchiness at the moment.

**Charlie Taylor:** We are up to nearly 500 teaching school alliances. The aim is that by the end of this Parliament there will be up to 600 across the country, and our aim is to focus on those areas that are less well represented. But Ministers are currently considering a bid from BCS about extending the current CPD programmes that are being run by CAS and BCS. It is not the case that we are stepping back. We are still taking an active interest in what is going on in terms of this and other parts of the new national curriculum.

**Professor Simon Peyton Jones:** With anything of the nature of giving every school £100 per pupil, you should not be too prescriptive; so do not say “Start a programming club”. Just say “This is to support your excellent provision of this”. Every school will be different. I am quite worried about being over-prescriptive about these things. I do think the suggestion of an Ofsted aspect survey would be good. Ofsted’s business—apart from assessment—is to improve the quality of teaching. If Ofsted, after a year or so, could go around and say, “Look, we have found excellent examples. We would like to celebrate the excellent ones and showcase them for other people to learn from”, that would be very helpful and might help address the patchiness question as well, because they could say, “Well, this area or perhaps this kind of school—it is not necessarily geographical patchiness—might not be so well served”. Ofsted is the perfect body to do that.

**Lord Kirkwood of Kirkhope:** I accept that, yes.

**Q155 Lord Aberdare:** Just two quick things: first, I am not entirely convinced that knowing that the Secretary of State is enthusiastic is the solution to the careers advice problem. Secondly, I think it was Sir Andrew who suggested that every board of governors should have an industry representative. Is there something we could recommend or that the Government could do that might promote that?

**Sir Andrew Carter:** Promoting it would be the thing. It is very difficult to find governors in schools, and often we are scratching around and finding people who just sit on the board, come to the meeting and read the papers the moment they are there. But what is industry? The commercial world, the people that create the wealth in a direct sense, have to take their responsibilities towards education seriously, and many do. On every governing body now, you have to have a governor responsible for special needs, a governor responsible for the curriculum and a governor responsible for RE. They may not even be technologically based,

but why not have a governor who is responsible for technology? Hopefully you can match that to a skill.

**Baroness O’Cathain:** Generally speaking, the governors know the children who are in the schools; a lot of them are parents. Plus here is a great opportunity to get somebody on board who has real life, hands-on experience of computing in the day job and then give them the power to be responsible for that. Also, if you are going to give them money, you need somebody to account for that money, so that could be part of the responsibility of Mr and Mrs X, who have kids at the school, and where he runs a computing facility.

**Sir Andrew Carter:** We give schools between £4,000 and £8,000 a year per child anyway, which is accounted in the system.

**Baroness O’Cathain:** I see.

**Sir Andrew Carter:** But this £100 is on top of that. You could be absolutely right: that could be one of that governor’s responsibilities, because you have a curriculum that they have to deliver. It would help and absolutely show the Government’s intention that they believe this is important. It is a tangible sign of that.

**The Chairman:** Lord Giddens. I am conscious we need to get on. Sorry.

**Professor Simon Peyton Jones:** It is not the Government who are responsible for technology. I am working to avoid getting fixated on technology, per se, unless it is technology to support teaching and learning across the curriculum, that is one slice.

**The Chairman:** The computer curriculum.

**Professor Simon Peyton Jones:** But we are focused on subject disciplines. The technology word often sneaks in and then it means one thing in the mouth of the person who speaks it and something else to the person who hears it. So you need to be very nuanced in what you are writing about this.

**The Chairman:** Yes, we do not want a governor responsible for buying computers, necessarily.

**Professor Simon Peyton Jones:** Exactly, yes.

**Q156 Lord Giddens:** We are running out of time, but digital technologies are associated quite strongly with inequalities. What can the schools do to mute those? Maybe you would like to talk about gender inequality particularly, since that has emerged as a big thing.

**Professor Simon Peyton Jones:** I am rather hopeful—you will have all seen the pictures of the hourglass economy with a hollowed out middle—that this new approach to teaching computing as a subject discipline will help more of our citizens, whether or not they become software developers. I want them all, including the ones who are going to become lawyers and hairdressers, to end up in the upper part of that hourglass. I am hopeful that it may, in some ways, help more people to end up in the top part. That does not directly reduce inequality but it can provide a route for children. Provided they have access to the basics of the technology, computer science can be quite an exciting way for some children who find other subjects difficult. Suddenly they thrive in it, so perhaps again it is a staircase for some; we have seen examples of that. I am hopeful.

**The Chairman:** Sir Andrew, what is your experience?

**Sir Andrew Carter:** You have to be very careful with inequalities. In my judgment, the greatest inequality in school, particularly in this, is in the financial divide that is in our society. Every school has a responsibility already to make sure that there are no inequalities, and you will have that governor as well. But what we have to watch here—this is where you come back to the technology—is that it is the hardware of this that is important. We can assume that children have these things at home and they do not. So schools should be making them available. We run Saturday clubs now for children so they can come in and use things and make it work in that way.

But we also have the pupil premium. The problem with the pupil premium is that it is being asked to do quite a lot at the moment, and if you put some computing into it as well that would be difficult. But, again, Ofsted is the key to making schools change. If anybody hears me say that, I shall probably get into a lot of trouble, but it is. There were no gates around schools until they introduced safeguarding and suddenly everybody had gates overnight. Ofsted could survey schools to look at that particular thing; not only whether computing is going well but how well we are addressing the inequalities around gender and of course finance.

**The Chairman:** Thank you. Lord Macdonald has the final question.

**Q157 Lord Macdonald of Tradeston:** From each of you, is there perhaps one key suggestion for change in respect of digital skills that we could recommend to the Government that is both viable and affordable?

**Dr Bill Mitchell:** It is extremely important that teachers can get access to some local CPD. We are suggesting to the Department for Education that they should be funding 1,000 master teachers. At the moment they are funding about 400. That is a very doable thing and is not at all expensive compared to the budget for the whole of education. It is a few million, so I would suggest that. The other thing that I would say is extremely important is to do some real research at primary school to see whether the good teaching of computing genuinely does support literacy in maths, because if that is true—and demonstrably so—it will transform what happens in primary schools.

**Professor Simon Peyton Jones:** The one thing that I suggest is just that we follow through on the path to which we have set our feet. That is, we make a big change in this particular area of the national curriculum. My fear is that the political spotlight will move on and it will become business as usual but—to change the metaphor again—the tender plant will wither and die just because it is not given enough water. We need to continue to water. It will be 12 years before my daughter, who has just started reception, does her GCSEs. Only then will the entire span of these two pages [of the new Programme of Study] have been worked out in practice. It is not going to happen overnight. We need to pay sustained attention, which does mean some sustained money, but relatively small kinds of money will do a lot. I think that £5 million or £10 million applied for central things like CAS—but not only CAS—to support the continued development of the subject and its pedagogy, particularly, which is still developing, would be extremely helpful. If we fail to do that, there may be a shrivelling up. Then that would lead to disappointment and disillusionment and people asking, “Why did we do all this and was it any good?”.

**Charlie Taylor:** I absolutely agree in terms of keeping up the momentum. The quite remarkable that is going on in schools is the level of networks that they are now building.

Whatever solutions are proposed by the Committee, we should think in terms of how the networks that already exist can be part of the delivery of this. For example, I visit teaching schools all around the country and I am just astonished by the sorts of things that they are achieving. Do not ignore the networks that are already there, which are already doing some amazing stuff around this. That would be my advice.

**The Chairman:** It would be very useful, collectively, if you could give us a map, both in terms of figures but also the geography of where things are happening. In a sense what we are pushing you on is the scaling up. It is not the change; it is the scaling up of what exists. It is quite hard to pinpoint how many master teachers there are and where are they. What is the overall geographical picture at the moment of how this is being delivered? Sir Andrew.

**Sir Andrew Carter:** I would agree. Focus on teaching schools and focus on the school-led system. I have mentioned the governor in every school. A compulsory lead teacher for computing in every school. Seed funding for pupils and more training at initial teacher training. But that will come out of our report as well.

**The Chairman:** Thank you very much indeed, all of you. That has been helpful, thank you.