Northern Ireland
Assembly

COMMITTEE FOR EMPLOYMENT AND LEARNING

OFFICIAL REPORT (Hansard)

STEM Subjects

18 November 2009

NORTHERN IRELAND ASSEMBLY

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Members present for all or part of the proceedings:
Mr Thomas Buchanan (Deputy Chairperson)
Mr David Hilditch
Ms Anna Lo
Mr David McClarty
Mr Pat Ramsey

Witnesses:

Mr Brian Campbel	)	
Miss Caron Malone	)	Sentinus
Mr Jim Stewart	)	
Dr Clare Passmore	)	Expert Panel on STEM Subjects
Ms Joanne Stuart	)	

The Deputy Chairperson (Mr Buchanan):

Without further ado, the Committee will receive a briefing from Sentinus on the promotion of STEM subjects.

I welcome the representatives of Sentinus. Brian Campbell is its chief executive, Jim Stewart is its chairperson, and Caron Malone is a STEM ambassador. The Committee is glad to have the witnesses here today. I ask the witnesses to brief the Committee. Any members who have questions will have the opportunity to ask them when that briefing has been completed

Mr Jim Stewart (Sentinus):

Thank you. We are very pleased to have this opportunity to tell the Committee about Sentinus and what it contributes to the education of young people in Northern Ireland.

I have been chairman of Sentinus since 2004 and a board member since 2002. I am joined today by Brian Campbell, our chief executive, and Caron Malone, our STEM ambassador. Caron also experienced several of our programmes while at school.

Sentinus has been involved in the delivery of educational programmes since 1982. It operated as the Northern Ireland Science and Technology Regional Organisation (NISTRO) and was located in, and supported by, the University of Ulster. In 2001, NISTRO merged with Industry Matters to form the current Sentinus organisation.

Sentinus is a not-for-profit educational charity that works with schools, colleges and businesses throughout Northern Ireland to deliver programmes that promote engagement in science, technology, engineering and mathematics: the STEM subjects. Sentinus has a voluntary advisory board with a wide range of experience and expertise and includes academics, industrialists and members of the public sector.

Sentinus is one of a UK network of STEM points, and it is the largest and most active of those groups. Working with children from age five to 19, Sentinus provides a wide range of programmes designed to support the teaching of STEM subjects with a real-world context, and its efforts are focused in three main areas: STEM subjects, careers and personal development. Sentinus offers a wide portfolio of activities at both a regional and a national level; it works with the main national STEM organisations and delivers programmes for the Science, Technology, Engineering and Mathematics Network (STEMNET), the Royal Academy of Engineering, the British Science Association and its Crest Awards, the Nuffield Foundation, and the Engineering Training Board. Through its activities, Sentinus aims to excite young people about science and technology, to enhance their enjoyment and understanding of STEM subjects, to encourage students to follow careers in those subjects and to equip young people with skills for the workforce.

I will now pass over to Brian Campbell who will expand on the work of Sentinus and how it

contributes to the overall STEM review.

Mr Brian Campbell (Sentinus):

Good morning everyone. In preparation for today's meeting I thought about the best way to get Sentinus's message across quickly in the limited time that we have, and I have, therefore, prepared an information pack for members. That pack is fairly detailed, but I draw members' attention to the top three sheets in it in particular.

The first sheet is a summary of the Sentinus organisation, why it is needed and the benefits and returns that it brings. I have also provided members with a summary statistics chart, which is a précis of the main information that will be covered today. The second sheet is a statistics chart which covers Sentinus's activities from April 2008 to April 2009. It provides a detailed breakdown of all of the programmes that Sentinus has carried out in that period, and I will make reference to those programmes later in my presentation. The third sheet shows a diagram of the STEM "escalator" and I will also refer to that later.

Jim mentioned that Sentinus has been established in Northern Ireland for 27 years. Originally, we dealt exclusively with STEM subjects, but we then merged with Industry Matters and took on the development of employability skills. Our emphasis remains largely on STEM subjects, and 90% of our output is geared towards enthusing young people about science, technology, engineering and maths and in trying to direct them along those careers paths.

We have a comprehensive portfolio of projects that we built up very deliberately. Sentinus offers a comprehensive range of projects at each Key Stage, from Key Stage 1 to post-16 education. As Jim mentioned, we are the largest STEM point. Although, we are one of a national network of STEM points, we are by far the largest in respect of our portfolio of activity, the numbers that we involve in our activities and our overall output.

We try to be efficient with the funding that we draw down. Last year, we received core funding of £400,000 from the Department of Education, and we brought in another £425,000 in cash ourselves. We did an audit to see how much our in-kind contribution — the value of our ambassadors, of the plant that the industry offers to us and of the equipment that it gives to schools — is worth. We worked out that the year's activity, at a conservative calculation, was worth £1·3 million to the education system. Given that that amount was underpinned by

£400,000 of funding from the Government, we think that we provide value for money.

We also try to be flexible in our approach to staffing. For instance, we have only six full-time staff. There are two project directors, of which I am one, two junior project managers and two administrative staff. In addition, we have 12 part-time staff who deliver the programmes. Given that we need more staff with different expertise at different times of the year, we need to be flexible.

We are regarded nationally as a benchmark organisation; I do not say that glibly. We are consistently asked to give presentations nationally. Several of the programmes that we deliver in Northern Ireland have been adapted to be delivered at a national level. Our flagship organisation, Young Innovators, has been used as a template for The Big Bang event, which is the main science event in the United Kingdom.

I will now talk briefly about three of our 14 programmes. The first is the STEM ambassador programme, which Caron will talk about later because she has first-hand knowledge of it. In Northern Ireland, we have trained and recruited 861 ambassadors, who have been checked by the Criminal Records Bureau (CRB) so that they can work in schools. Given that they are by far the biggest cohort of ambassadors with a STEM background anywhere in the United Kingdom, the advantages that they can offer to different programmes are evident.

The second programme is the STEM R&D team, which is a leadership programme aimed at students over 16 years of age. We put students into teams of four and pair each team with an industry contact. The industry sets the team an R&D problem that they have seven months to solve. During that time, the teams take part in residential courses at the University of Ulster so that they can develop a solution to the problem.

Last year, 38 teams went through that programme, and, this year, we expect that that number will increase by eight or nine, because we have a specific initiative for the food-and-drinks sector. We are also trying to push that programme down the sector skills route to get teams working on R&D in each of the different sectors.

Finally, there is the programme of STEM roadshows, which cover the full age range. We run a series of STEM roadshows on robotics, science, technology, and so on, with titles such as ‘Lost

in Space'. Last year, we held 208 individual roadshows, and those provided a full day's programme for each school. The roadshows include pre-event work, which is carried out before we go into the school, and post-event work, when the day's programme is finished.

The roadshows are particularly well received by primary schools, where expertise in STEM subjects is very limited; some primary-school teachers are not confident in delivering science and technology in the classroom. Those teachers find that the roadshows and the expertise that we bring help greatly.

Included in our submission is an inspectorate precis of an evaluation that was done on our organisation. If members take the time to look at that, they will see that it is very complimentary; it says that we do things professionally and that we follow through. Sentinus evaluates everything that it does. Every programme with schools, from the one-day programmes to the seven or eight-month programmes, is evaluated. That is fed into our system, which is amended accordingly.

The statistical information table, which is included in our submission, is a quantitative result of that evaluation. Members will see that we were very careful to operate, for want of a better word, politically. In other words, we spread across Northern Ireland into all counties. We also try to ensure that Catholic and Protestant schools are given a fairly even proportion of the work that we do. Integrated schools are included in our work, and, over the past five years, we have been pushing more and more into the lower-secondary- and primary-school sectors. We realise that it is at that level that an impact can be made on young people, rather than at post-16 level. The work that we do with post-16-year-old students is seen as reinforcing work to lead them into particular areas of STEM, rather than to develop an initial interest.

The statistic sheet shows the number of advisers that we have from industry; in 2008-09, we had 2,077 people from industry working on our programmes. That is quite a cohort. In addition, I remind you of the 861 trained STEM ambassadors, and 3,288 teachers were involved in our programmes.

The overall statistics that I have provided show the impact that Sentinus is having and the number of schools that it operates in. At a post-primary level, we are involved with 218 schools, which is 93% of the school population, and that is fairly good coverage. We are involved with

493 primary schools, which comprise 54% of the total school population, and, again, that is significant coverage.

In 2008-09, we had an overall impact on 60,592 students. That was done for a total contribution of £400,000 of public money, plus the money that we generated and the in-kind contributions.

The main benefit of Sentinus is in stimulating the interest of young people to take up STEM careers. Our other main goal is to go into schools and let young people look at the work that they do in school in a real-world context. It is important for pupils to see that science, technology, chemistry and whatever else they may be studying matter and will make an impact in the outside world. We try to involve students with industries that are enmeshed in that sort of work. The overall aim is to improve the quality of the future workforce and to enhance the individual student's ability to make better career decisions.

The statistics show that we are almost evenly balanced when it comes to gender. In 2008-09, there were 30,523 male students and 30,069 female students. I realise that that is quite a coincidence, but that is what happened; those are the actual figures. We deliberately tried to involve as many female students as male students right across the age range.

In conclusion, our message is that we have something that is good and is highly regarded. The problem over the years has been to get the message out that we exist. The schools know that we exist, and they are becoming increasingly demanding of the work that we are doing. We are oversubscribed in every single programme, and we cannot meet the demand from schools, and that means that we have to impose quotas.

We have something good; we believe that we are an efficient organisation. We try to run things as a business rather than as a charity, although we have charitable status, and we try to be cost effective and to do things properly. We believe that we can contribute significantly to the objectives of the STEM review. Two of the major objectives are to involve business with education — in everything that we do, we achieve that — and to ensure that a proportion of learning for young people, particularly in STEM subjects, is real-world learning. Again, we believe that we provide that.

We would like to do more. We want to be able to respond to the demand that we are getting from schools, but, unfortunately, our biggest difficulty is that our resources are constrained. I remind the Committee that, although we draw down core funding from Government money, we match that in cash from other sources, which we bring in ourselves, and additional resources that we bring in go substantially beyond the cash that supports the project.

That is all that I have to say. Our presentation pack contains material on our projects, such as the STEM ambassadors scheme and the Nuffield bursary schemes. I do not have time to refer to them all, but the background information is there. I will introduce Caron Malone, formerly of Rathmore Grammar School, who attends Queen's University, Belfast, and is on placement with Northern Ireland Electricity (NIE). She took part in several of our programmes and will tell the Committee about that.

Miss Caron Malone (Sentinus):

I am a STEM ambassador, and I will relate how I was introduced to Sentinus and the reasons why I am involved in it. I went to Rathmore Grammar School, and technology, maths and physics were my favourite and best subjects. In my fourth year, my physics teacher pointed out a group of four sixth-year students to our class, and told us that they were the school's engineering team. I remember him describing them as "the dream team" and telling us that they were so smart and had won lots of prizes. I knew then that I had to be on that team one day.

When I reached sixth form, an email was sent round the year group for applicants to be on the new engineering team. I applied, and, to my delight, I was successful. At our first meeting, our teacher greeted us as "the new dream team" and told us that we would be taking part in the Sentinus engineering education scheme. Things went full steam ahead from then on. We had to go to training days with all the other schools and meet the engineers from Phoenix Natural Gas with whom we would be working.

At our first meeting with the Phoenix engineers, they gave us a task of solving an everyday problem that they had, which was to create a locking mechanism for their valve-box lids. Initially, we did not even know what a valve-box lid was, so the task seemed incredibly daunting. However, we began by learning the basics and determining what was wrong with the existing mechanism. We tried to come up with a solution, but our early ideas were elaborate, and the Phoenix engineers ruled them out because they were too costly.

For the first few weeks, our meetings seemed to have no direction, and we felt as though we were going in circles. Up to that point, I had arranged all the meetings and chased down the Phoenix engineers to come to meetings every week. I took notes of the meetings, so, when we decided that we needed a team captain, the team quickly voted for me to take that role. From then on, things started to improve. We continued to come up with ideas and eventually decided on one that we would run with. We developed the idea for the mechanism and discussed what it should be made of.

Our finished solution was a plastic pin the same size as an M12 bolt, which pushes in rather than screws in. The valve-box lid can be opened when the head of the pin is broken with our specific tool. The pin can be recycled and replaced with a new one. As simple as our idea sounds, Phoenix Natural Gas thought it ingenious.

I put a lot of work into the project every night, preferring to do that than even my homework. I am pleased to say, however, that it paid off. We took part in the engineering education scheme presentation day. We had to erect a stand, show off our design, and give a presentation of what we had done. We all thrived on the great reviews that we received from the many people who visited our stand. We were even invited to compete in the bigger Young Innovators competition. We knew that we would have to work much harder to perfect our sales pitch.

In no time at all, the day of the Young Innovators competition, at the Odyssey Arena, arrived. We spent the day being interviewed by judges, telling them what we had done and explaining the huge time and cost savings that our design offered. It was an exciting day, unlike anything that we had expected. The award winners were announced at a presentation ceremony at the end of the day. As much as we thought that we had done well and had come up with a good idea, we had not considered it to be worthy of an award. Much to our surprise, however, we seemed to be the few who thought that.

We won a golden CREST award; the Bombardier Aerospace award for working with industry; our group category, which was the Young Engineers for Britain, 17- to 19-year-olds category; a special Phoenix Natural Gas award; and the overall competition, which was the Intel International Science and Engineering Fair (ISEF) prize for young innovators 2005. That final prize entitled us to represent Northern Ireland at Intel ISEF, the world's largest science and engineering

competition for under-21s.

It was incredibly exciting to think that we were good enough to represent Northern Ireland, and, again, we knew that we would have to work even harder to compete at world level. We went on an all-expenses-paid trip to the ISEF in Indianapolis the following May. It was an experience like no other. The competition was of such a high level that it was hard to believe that some projects had been done by teenagers. It was a great week, and it was fantastic to meet people of so many nationalities.

The engineering education scheme and ISEF remain the best experiences I ever had. They were my first true insight into the world of engineering and made me realise that I wanted to be an engineer. They also introduced me to problem solving, idea development, researching materials and the market, and pitching an idea. They also helped to develop my team working and team leading skills and skills such as writing professional reports and making presentations. I still use those skills.

I have just finished my third year of studying electrical and electronic engineering, and I am also on a power academy scholarship with Northern Ireland Electricity. I am very lucky because I have achieved a lot since school, but most of that would not have been possible without the engineering education scheme at school.

Last December, I volunteered to be the link engineer for primary schools on a Sentinus project called the Intelligent Clothing scheme. The scheme sounded fun and similar to the engineering scheme that I did at school, except that I would now be the engineer. That was scary, because I had been a student on such a scheme only a few years earlier, so I thought that I would not know enough to be a good engineer. However, I love a challenge and willingly took part.

I was chosen to be the link engineer with Victoria College Preparatory School, Belfast, and was registered as a STEM ambassador. The scheme was enjoyable and a great success. Everyone came up with great ideas for their pieces of intelligent clothing, which they designed and made. The students put on a catwalk display at a presentation day, and that went down a treat.

I have been a STEM ambassador at other Sentinus events, such as open days. In June, I was excited to be asked to be a judge at the Young Innovators competition at the Odyssey. As a

former competitor, it was nice to be on the other side of the judging table. As much as I missed the excitement of competing, the standard of entries was so high that I was glad that I was not competing. I am a member of The Institution of Engineering and Technology (IET) Northern Ireland young members committee, and I recently became a mentor for the First Lego League, working with NIE and a school from Belfast. I am currently captain of the Queen's University "enviro-chefs" team in the npower Future Leaders Challenge.

All my work with Sentinus benefited me in so many ways, and each experience helped me to prepare for new things, whether being on an engineering team, being a team captain, or being a mentor engineer working with schools. I am very lucky to have come through Sentinus as a student and an engineer, because I can see at first hand the difference that it makes, and because it made me choose to be an engineer.

Mr Jim Stewart:

In conclusion, we are all pleased that the Executive have made the economy their major priority. To achieve the objectives, we all need to develop the future managers who will run the industry that is needed to improve the overall economy. Sentinus is perfectly placed to give the impetus for young people to go down the STEM route.

Historically, one of our difficulties has been that, every summer, we had to make a trip around various Departments to find out whether we would get funding for the next year. There has never been a long-term commitment. We would like a commitment to emerge from the STEM review that the funding will continue so that we can have stability. There is no doubt about the success that we have achieved; there are some brilliant young people in Northern Ireland who can make a tremendous commitment to the economy in the future, but we need to develop them.

We are pleased that the STEM review has taken place, and we are pleased to have the opportunity to tell you about our work. We are happy to answer any questions.

The Deputy Chairperson:

Thank you for giving us your presentation. I commend you on your work, on the number of students that you are working with and on the programme delivery that you are involved in. The number of roadshows is phenomenal. I congratulate Caron on her presentation and on providing an insight into exactly where she has moved to and what she has done. By hearing her account at

first hand, we got a valuable insight into the valuable work of Sentinus, and we heard exactly what is being delivered. That work is exactly what is needed to allow the economy to strengthen and grow.

You mentioned that you work with 218 post-primary schools and 493 primary schools. How do you determine which schools to work with? Are criteria set down for a school to be eligible for you to work with or deliver a programme to? Obviously, there are a number of schools that you do not work with.

Mr B Campbell:

The criteria vary. Because the programmes are targeted at specific age groups, the schools that are eligible to take part in them are limited. Only a certain number of schools can take part in a programme that is targeted at the post-16 age group. Some programmes target children of primary school age, and others target the lower years of secondary schools. We did 208 roadshows, which sounds like a huge number, but we are oversubscribed, and we could easily do 416 at the drop of a hat. We use a rotation system; we go to schools that did not have a roadshow the previous year. When we fill up the places with those schools, we backfill the remaining places with the schools that had a roadshow in the previous year. We do that on a rolling basis.

We have a contract with STEMNET to try to place every school in Northern Ireland on what we call a STEM escalator. We have distributed to the Committee a diagram showing that. We estimate how competent schools are on STEM capability. We put schools on one of five tiers on the escalator, and, once that model is complete, we intend to use it to target schools that might need their STEM capability to be raised.

Stage 1 of the escalator is entitled "Non-Communicators", in which schools, whether secondary or primary, provide basic STEM coverage, which they have to provide as part of the curriculum, but nothing else. Stage 2, "Potential Adopters", is for schools that might have one programme that is brought in from outside or to which have someone comes to give a talk. At the top level, stage 5, are schools that build STEM into their business plan. They apply it through all their age groups, and they know exactly what they are doing with their STEM coverage. It is our objective for every school to work at that level, which is entitled "Integrators".

Mr Jim Stewart:

Not every school requests Sentinus programmes. Much depends on the initiative and the enthusiasm of teachers. In GB, money for STEM work was given directly to the schools, but the vast majority of schools pocketed it and used it for something else. In contrast, we come in and carry out the programmes, and we engage with the kids. We bring expertise and other ambassadors, so it is a better programme.

Mr B Campbell:

Some schools buy programmes from us. If we have no roadshows left and a school wants one, it can have one if it is prepared to pay for it. We have contracts with the specialist STEM schools, whereby we deliver a substantial amount of STEM activity, and the schools pay for that. They get their baseline free programmes that we offer to everyone. Beyond that, however, they pay a substantial amount for additional programmes. That is quite a good route, because those schools act as core focal areas in particular locations, and feeder primary and secondary schools will go to them to take part in programmes.

Mr Jim Stewart:

I must emphasise that Sentinus is a not-for-profit organisation: everything is ploughed back into the school system. The number of administrative staff is very small, so the value for money is tremendous.

Ms Lo:

You are all very welcome. Caron, your enthusiasm will fire up the children. We need to inspire them. It is particularly wonderful for a girl to be an engineering role model — well done.

There are a smaller number of integrated schools, but, according to your submission, they did not seem to participate in any of your Young Innovators programmes. Is there a reason for that?

Mr B Campbell:

As you say, there are a limited number of integrated schools. The figures indicate that 46 primary schools and 12 secondary schools participated. If the five schools for post-16 education are included, that makes 17 secondary schools, and that is not too bad in relation to the overall number. We distribute information about the Young Innovators competition at the Odyssey and the Big Bang event throughout the year. We try to encourage schools to come to the event

through work that is done on our projects and other STEM projects. That work is done on an ongoing basis. When all of our people go to schools, they promote that event as well as doing their activities. We phone every school after Easter. Every head of department for maths, science and technology subjects is contacted, and we invite and cajole them to enter. If a school does not want to take part, then it does not. It is a bit of an anomaly that no integrated schools are involved in the Young Innovators programme, but it is one of those things in that particular year.

Ms Lo:

A lot of programmes involve only one school. Is that the same school? I see from your statistics that you ran an Insight programme for boys and one for girls in post-16 education. Were they from the same school?

Mr B Campbell:

No. With those particular programmes, we are, again, constrained by numbers. There are 60 places in each of the programmes, and we cannot take more than 60 students. As long as schools have the baseline application criteria, places are allocated on a first-come-first-served basis. The youngsters, for instance, must be studying two science subjects at post-16 level. It is highly unlikely that those two programmes were in the same school. It would be a big coincidence if they were.

Ms Lo:

I wonder whether you should contact the likes of the Northern Ireland Council for Integrated Education (NICIE) to see whether you could promote your schemes more to the integrated schools.

Mr B Campbell:

That is a good suggestion. We try to deal with the different bodies. For instance, we are currently talking to the sector skills councils. We talk with the education and library boards, and we are doing several projects with them, but we have not really talked to NICIE.

Mr P Ramsey:

You are all very welcome. Caron, I wish you well in your studies. By the looks of things, you certainly have passion and determination. Good luck. What do you get out of being an ambassador? What drives you, and what value do you bring to the employer and to industry?

What do you sense that the young people who you talk to — your students — get out of it?

Miss Malone:

I worked recently with Victoria College. That is an all-girls school, so it was an added bonus to be able to promote the STEM idea to girls.

There are five girls, including myself, on my course, so I know that girls are not as attracted to STEM subjects as boys are. I am a STEM ambassador, but I do not see the subjects as only a list of areas in which I get involved in my spare time to put on my CV. In the schools in which I worked, I know that I switched on a light in the children's heads, because they were able see what I study and what I work as. Children of that age do not think about studying such subjects, and it is important to let them know that it is important to think about these subjects. They are young, but they should be thinking about the subjects that are available, because their careers will be shaped as they go through school. At the end of the scheme, a couple of girls told me that they wanted to do what I do, and I was glad that at least one or two girls had got something out of what I had said to them.

I love working with children, and a lot of my friends who are STEM ambassadors enjoy the schemes, because they are great to take part in. For instance, it was great to go round the stands at the Young Innovators event at the Odyssey and see the bright minds of Northern Ireland. You would not believe the scale of some of the projects; they are incredible. I get a lot out of it.

I include my involvement in the schemes on my CV, and that is what employers are looking for. STEM ambassadors are volunteers; we are not paid. Employers from the utility companies, for instance, are looking for people who, in their spare time, become involved in schemes that are related to their careers. The promotion of STEM subjects in schools is related to my career. The students, ambassadors and companies can get a lot out of it.

Mr P Ramsey:

It is clear, Caron, that you get enjoyment from your work; I suppose that is the reward.

Can you provide a breakdown by constituency of the schools, students and ambassadors that have availed themselves of the programme? I am not asking for a lot of work. It would be good for members to see what is happening in their towns and the value of that work.

I appreciate that my next question is more difficult. You have provided great information, and the content and the participation level is obvious. Is there qualitative evidence that more students are going into STEM subjects as a result of the programme? Has an evaluation been carried out on the number of young people who became involved in STEM subjects as a result of the ambassadors' programme, for instance, last year?

Mr B Campbell:

We keep detailed information on all the schools that we work with. On completing any scheme — even a one-day programme — our staff have to complete four or five forms before they are paid. That administrative work includes details such as the location of the school, contact teacher, and the number and gender of the pupils. That information is given to the administrative staff and fed into our database. We have the details of the programme that each school took part in, the number of students who participated, the contact teacher and the relevant department. The statistics that we provided to the Committee are a précis of the information pertaining to one year's activity.

We could provide a breakdown by constituency, but we have not done so, because work by constituency was not an underpinning driver for us. Making sure that we are delivering equally across board areas and that we are doing as much in the west as we are doing in the east, north and south is a driver for us.

Mr P Ramsey:

I am not suggesting anything otherwise.

If I were driving the sales of your product, I would ensure that all Assembly Members, not just those in the Committee for Employment and Learning, knew what I was doing for people in the City of Derry.

Mr Jim Stewart:

That is a very good point. Unfortunately, a lot of schools do not have any interest, but others are really keen. It depends on the teachers. Some really good, enthusiastic teachers drive the kids.

Schools from the South of Ireland also take part in our programmes. The Young Innovators

programme starts in September and runs through the year, and its big final day is in June. At least 500 kids take part in that final event. I invite any member of the Committee who is available in June to come to that event, because it is worth seeing. A lot of local politicians have attended in the past as guest speakers or as participants. The event is worth seeing.

Mr B Campbell:

The Young Innovators event is the biggest of its kind in the UK by some margin. BT runs the Young Scientist event in Dublin. That has a budget of €1·5 million — at least it did two years ago. That event runs for a week. The teams are put up in hotels, and every TD attends the event, because youngsters from their constituencies are participating and they are there to support them. The President, the Taoiseach and a lot of TDs attend the final and the award ceremony. The event is given a great deal of importance and credibility, and it is covered on television every night. The emphasis in the event is on STEM subjects.

Having said that, we have an event here in Northern Ireland that is the biggest in the UK by some margin in the number and quality of its projects. It is affiliated directly to the ISEF competition in the United States, which is a worldwide competition. We try to get interest stoked up and people to attend, and, increasingly, we are succeeding. Last year, for instance, two Ministers and several MLAs attended the event, but we would really like to increase that number.

The Deputy Chairperson:

Have you made a presentation to the Education Committee?

Mr Jim Stewart:

We are arranging that. The Minister has attended a number of our events; in fact, she will be attending an event that we are organising in the King's Hall next Tuesday. She is very passionate about what we are doing. We have met with Mervyn Storey on a number of occasions, and he attended the Young Innovators event last year. The next step for us is to speak to the Education Committee, and we are arranging that meeting.

The Deputy Chairperson:

Given that there are no other questions, I thank you for coming along today. I take on board your concern about a long-term commitment to funding. As a Committee, we will consider that to see whether we can assist you with anything. We will be mindful of that in the days to come. Thank

you for taking time to come along and give us an insight into exactly what is being done. It has been an education for me, and I commend and congratulate Caron on her achievements. They are excellent, and it is good to see our young people rising to such heights in Northern Ireland.

Mr Jim Stewart:

I also thank Caron for coming along. She volunteered to give her presentation, and we are pleased that she is part of our team.

The Deputy Chairperson:

We will now hear a presentation from Joanne Stuart, who is the chairperson of the Committee's expert panel on STEM subjects, and Clare Passmore, who is a member of that panel. Members will recall that the Committee commissioned a review into STEM subjects, and our two witnesses were part of that review.

We will hear their views on the STEM review, and the Department will respond. The Committee has contacted the relevant stakeholders and received some good feedback, a synopsis of which will be brought to a future Committee meeting. We are delighted to have Ms Joanne Stuart and Dr Clare Passmore with us to give us their views on how the review has been conducted.

Ms Joanne Stuart (Expert panel on STEM subjects):

I thank the Committee for giving us the opportunity to present our views.

I will begin by outlining the views that we represent. I chaired the Assembly panel discussion in February. I am the chairman of the Institute of Directors, so I am also representing the business community's view of the review. I am also a non-executive director of Sentinus and a trustee of the Integrated Education Fund, so I will take on board the point that was made about that project.

I am joined by Dr Clare Passmore, who works on MATRIX and was a representative on the STEM review. We are also representing Damien McDonnell, who is the chairperson of MATRIX; Dr Sam McGuinness, who is a lecturer in education, leadership and management at the University of Ulster and has an educational background in the post-primary sector; and Professor Roger Woods from Queen's University Belfast, who has submitted a written response, which will

be reflected in our comments today. We will send our written response to the Committee by the end of this week, so I will just summarise its main points.

In general, the report from the review is excellent and has been very well received in its focus on the main challenges of STEM subjects. Dr Hugh Cormican, who chaired the review, Dr Alan Blair and the rest of the review team are to be congratulated on their work. The strength of the report lies in the way that its 20 recommendations are founded on clear evidence from relevant sources.

Given that the economy has been placed at the centre of the Programme for Government, we are moving towards a sustainable and knowledge-based economy. Promoting and increasing STEM skills are essential to meeting that objective. MATRIX published a report last year, which was adopted by the Executive. That report identified a strong need for a STEM skills base so that Northern Ireland can achieve its objective. Therefore, we urge the Executive to adopt the review report and promote actively and implement its recommendations.

Before we detail the different areas that are covered by the recommendations, it is important to talk about their implementation, because, as with many similar documents, although the review is very good and has a very sound base, we need to ensure that we move it forward. A joined-up collaborative partnership with business, different Departments and stakeholders is required to ensure that we can drive forward the recommendations. None of that can be done in isolation.

One of our recommendations is the creation of a STEM implementation steering group with representatives from each of the main stakeholders to oversee and drive forward the implementations. Membership of that group should include, as a minimum, people from business, and that role could be fulfilled by a representative from the STEM steering group. Representatives from the Department of Education, the Department for Employment and Learning (DEL) and the Department of Enterprise, Trade and Investment (DETI) should also sit on the group. Those representatives should occupy a senior level in their Departments, be that as a Minister or as a senior official. We should also consider representatives from other Departments, such as the Department of Health, Social Services and Public Safety (DHSSPS).

There would also be other contributors to the group, such as the skills adviser from the Department for Employment and Learning, representatives from the sector skills councils and the

chief STEM adviser. That is one of the recommendations that we support. Such a group is needed to bring everything together. The group would have members who are senior enough to make decisions and to clear any blockages or barriers to the implementation of the report's recommendations.

The recommendations cover four areas, the first of which concerns business. Throughout the report, the business sector is seen as being one of the main drivers in moving the recommendations forward, and we concur with that. Businesses in Northern Ireland are taking action. As the Committee heard in the previous presentation, over 2,000 businesspeople are involved with organisations such as Sentinus to promote and drive forward awareness of the STEM agenda.

For example, there is School Employer Connections in Foyle, formerly known as the Foyle School and Employer Connections (FOSEC), and Almac has an outreach programme in Craigavon. Some businesses in Bangor link through the South Eastern Regional College, and there is company engagement in Sentinus.

We were disappointed that those connections were not reflected in the report. There was not a lot of information about the good things that are going on already. However, having said that, we support absolutely the creation of the recommended framework. From a business perspective, I have looked at a wider base. We need to be more consistent and make it much easier for schools and business to engage, not just with the STEM subjects but across the whole spectrum. That framework will focus on STEM and will provide a model that can be rolled out to create wider engagement with business and schools. We think that that is one of the core elements of the report and that it will enable other objectives to be realised.

The challenge is to bring together the management of disparate industries in a common framework. The Government have a role to play by helping to facilitate and promote that idea, but we have to think about how we will manage it in the business sector. From the perspective of the Institute of Directors and the Business Alliance, I have begun discussions with the Department for Employment and Learning on how we can resource and manage that idea from within the business sector. We are both putting together proposals that can be shared with the Committee once we get to the next stage. That will be important to ensure drive and focus.

As I said, good things are going on. Other recommendations have been made, and it is important that we do not re-invent the wheel and that we understand what has been happening. A lot of work has been going on in the field of ICT, which is a part of STEM. The Bring IT On campaign has been put together by DEL, Invest NI, DETI, e-Skills UK and Momentum, which is the trade association for the ICT sector. That campaign looks at matters such as career paths, which is mentioned in the report's second recommendation, role models, encouraging girls to take the STEM subjects, which has been mentioned already, so that the gender imbalance can be rectified, and company profiles. Business in the Community works to engage schools with business, and a lot of good work is going on with the sector skills councils, particularly Semta, in encouraging girls to take up engineering. Momentum does a lot of work on an all-island basis with, for example, InterTradeIreland. We can learn from that to widen scope for the STEM subjects. The workforce development forums, which are collaborative partnerships with business and the further education colleges, are also relevant.

In short, a lot of work is going on. It just takes some co-ordination and some leverage to bring that work together and use it as a foundation.

From a business perspective, scholarships are critical. The Institute of Directors took ownership of one of the actions in the regional innovation strategy action plan. That was about putting together bursaries and scholarships for students taking STEM-related degrees. We are working through that. It has been particularly difficult over the past 12 to 18 months, as many businesses have found going through the recession very trying. However, proposals to look at different cost bases for businesses to get involved and to provide students with more than a financial incentive have started to come together. For example, we have the Queen's University STEM bursaries; however, that aims to provide business mentoring, summer work and other similar schemes. Therefore, it is a much fuller scholarship. We will be driving that forward with the Department.

There are also regional STEM links. In this respect, we must be sure that we are close to the work that is involved in the implementation of MATRIX. MATRIX has identified the industry-led innovation communities, and that provides all the different links. Our recommendation is that, as part of this scheme, the STEM implementation be very close to the MATRIX work and should pick up the particular areas that are important to STEM. That is how we see that area progressing.

Let me move on to constraints on the STEM artery. It is fundamental that we get this matter right. We all believe that, in education, pupils are being encouraged to take STEM subjects. We heard the presentation from Sentinus. That type of programme should be used to engage and interest pupils. Information released from the Northern Ireland Science Education Forum (NISEF) in 2008 shows that there has been a net loss to STEM subjects of 2,000 pupils in the choices that are made for GCSE subjects.

However, that information shows that there has been an increase in students who take single sciences rather than single and double awards. That is great. However, we are continuing to lose pupils studying STEM sciences, and that is an issue. We believe that at Key Stage 3 and Key Stage 4, the school curriculum must revert to the core subjects of chemistry, physics and biology rather than the merged science course that has been in place since the 1980s. That type of course has a role to play in enabling people to gain an understanding of science. However, we need to encourage more children to study single sciences.

Furthermore, we need to make science fun; that is why Sentinus is so important. We need to encourage schools to get involved in events such as the Young Innovators and Young Scientist, which were mentioned earlier. It is great that the number of schools that are involved in Young Scientist in Northern Ireland has increased significantly this year. However, both schemes need to be brought into an all-island context, because a lot can be learned through schools collaborating and working together across the island.

The careers service is another area that can help young people to make choices, and it is important that good careers advice is available to pupils. They must engage with careers services, which, in turn, must engage with businesses. That will increase knowledge and raise awareness.

The report states that leadership in schools is critical to drive STEM subjects. As Brian Campbell said earlier, the schools that have leadership and a champion for STEM are engaging and getting the most out of it. We need a drive towards engagement, and the idea of a business plan for STEM should be considered and encouraged in all schools. A STEM champion is necessary to drive that idea.

The other area is scale, which was raised in the previous presentation. Many good schemes

are ongoing in schools. However, that work is inconsistent, and we need to achieve consistency. How do we scale that up for Northern Ireland?

Dr Clare Passmore (Expert panel on STEM subjects):

Equality is linked to that. The number of head teachers who are not engaged, particularly in primary schools, is disappointing. That could be linked to the fact that compulsory science is not required. We talked about Key Stage 3 and Key Stage 4. However, Key Stage 2 is important, because that is the entry point. It is a concern that that disengagement exists — and we know that from more than just anecdotal evidence — and that it is linked to equality across the whole community.

Ms Joanne Stuart:

I will move on to the flexibility in the provision of STEM education. We support all the report's recommendations and believe that the role of further education colleges is pivotal. I have outlined that in my report on student fees, which the Committee has not yet seen. That needs to be considered in higher education, and I am on the steering group for the development of a higher education strategy. We need to consider how to encourage and support people to choose to study the subjects in question. Careers education is critical, and the education of careers teachers is important.

I have raised that issue with the Department for Employment and Learning, and we responded to the consultation period on the careers strategy, which is now in place. I received some information from the Department of Education about an action plan that has been implemented to examine the potential benefits of providing full-time STEM co-ordinators who will focus on Key Stage 3 learners. The objective is to draw together the curriculum and to work with the careers service. We support that measure, and we will follow it up with the Department of Education.

The final area is the governance of the STEM agenda. We are supportive of that, and one recommendation is to have a clear STEM strategy and vision. We agree with that idea. However, that needs to be done quickly. The information for that and the way in which the report was compiled should make it more straightforward to create a strategy that can be put in place. The information is available, and, therefore, we cannot afford to spend another 12 months putting a strategy together. The strategy must be cross-departmental and, we believe, must be owned by the Northern Ireland Executive.

I want to point out the need for the appointment of a chief STEM adviser. We need such a person to drive the agenda forward. We believe that the adviser needs to be somebody who knows the industry and who the key players are, is independent and understands the working of government. They need to have credibility in the industry and in government. It goes without saying that they need energy and drive to push the agenda forward across different Departments.

We see some challenges in driving this forward. Collaborative working is a challenge that we need to work through. How we scale up for Northern Ireland is another challenge, as is the education of the wider society. There is a lot of focus on schools and on people who are studying for degrees in business, but we have to look at those who influence pupils in making their choices, which is people in wider society. Funding is always a challenge, and we need to examine how we measure the impact of interventions. For example, a STEM passport has been suggested. That could be issued at primary school, and it would enable us to measure an individual's progress. This matter can be very difficult to understand; if pupils go into a particular programme, does that mean that they go into a STEM programme? We need to measure interventions.

Our next steps are to provide the Committee with written evidence, which we will do before the end of the week, and I have spoken to Mervyn Storey about giving the same presentation to the Education Committee. We think that it would be a good idea to have a follow-up to the panel discussion that we had in February across the three Committees.

I hope that that has given you an outline of our views, and I am happy to answer any questions.

The Deputy Chairperson:

Thank you for your presentation. You have given us much food for thought. I agree that there needs to be joined-up work between businesses and the Department of Education, DEL and DETI to drive the STEM agenda forward. What buy-in do we have from businesses at the moment? Do you see that increasing through the review and the implementation of the report's recommendations? Can you see that increasing the essential buy-in from businesses?

Ms Joanne Stuart:

There is buy-in from across the entire business community, and there is a real acceptance that we need to increase the level of STEM skills, not just in STEM-related industries. The sorts of skills that people will develop are valuable to a number of different industries. The problem that we have in business is in corralling those skills. As I said, some good work is going on, but it is not consistent.

Part of the problem is communication, which is a challenge even in the institute. How do people in the sector ensure that they get the message to everybody? It is a continual challenge, because they might not reach somebody the first time they communicate, so they have to communicate continually. That is why I was very pleased to have the opportunity to speak to the Department about putting a programme co-ordinator in the business sector who can start to bring that work together and provide a communication channel. Sometimes it is just down to communication and a lack of awareness of what is available, what is going on, and how businesses can engage.

The Deputy Chairperson:

That is the difficulty that was demonstrated in the previous presentation, because what the STEM programmes are providing is not really being sold.

Ms Joanne Stuart:

There is an example in north-east England that we need to look at. Some businesses got together and employed teachers to go out and sell their sectors and the opportunities therein. That is the type of thing that we need to be looking at, and we must then ask ourselves whether we can do something similar in Northern Ireland.

Dr Passmore:

I have spoken to some business representatives, and they are quite disappointed when they are asked how they engage, because they are doing so already. It is just a matter of making sure that that is known. As Joanne said, schemes in Northern Ireland are in place at the moment, but they are in pockets. Therefore, the agenda needs to be co-ordinated and led by somebody who owns it.

Mr P Ramsey:

You are both very welcome. Your document is interesting, and it is clearly very independent. I

am fairly new to the Committee, but I am hugely interested in STEM subject matter, particularly in my constituency, for different reasons. As well as the recommendations, one can imagine that we could construct an action plan to deliver on those recommendations over time and on how we measure their impact.

I am concerned about continued professional development at primary school, as was mentioned in the previous presentation and as you highlighted in your report. If there is not ongoing modernisation among teachers at primary school, one would imagine that there would be difficulties with teachers not having STEM skills.

I have a number of questions, and, because we do not have time, I might seek a further meeting with the panel.

I am alarmed by the number of dropouts from STEM subjects at universities here. How does that compare with the figures in other regions? There are always discussions about why students leave here; in fact, I have a daughter who is over in London.

One of the recommendations in the report was to expand the capacity to respond to skills shortages. What collaboration has there been with higher education and further education colleges to ensure that there are more courses in STEM subjects at that level? Who determines that need? Presumably, there would have to be discussions with DETI about industry's future needs and demands. Therefore, what collaboration is there, and are we aware of the universities' plans to expand STEM subjects on their campuses?

I know that time is short; however, you talked about discussing this matter further in an informal setting. I am looking forward to your briefing on student fees, as that is an issue that I am getting a lot of questions on. I do not want to bore people, but I am very interested in the subject.

Ms Joanne Stuart:

We can touch on those questions, if you want, and we go into more detail in the written response that we are submitting.

The Deputy Chairperson:

A follow-up event is being organised for the Committee for Employment and Learning, the Committee for Education and the Committee for Enterprise, Trade and Investment. That event will be informal, similar to the one that took place in February. We will invite you folks to that event, and perhaps that will be the forum at which we will get our questions answered.

Ms Joanne Stuart:

We have not picked up on the issues on dropouts and continuation rates in our written response, but I looked at that when I considered student fees. That issue has been raised as one that needs to be looked at in the development of the higher education strategy. However, we have not mentioned it specifically in our response. Therefore, I will do some work on that, and we will be happy to meet Pat on a one-to-one basis and go through some of the issues that he raised.

Ms Lo:

It is important to link the business sector with schools. The Committee went to the United States to look at some community colleges, and we were hugely impressed by the input from industries; whole floors of colleges were equipped by industry, dentistry and so on. The businesses that are involved benefit from students going into the industry. It is a two-way process, and industries are not doing it for nothing.

Ms Joanne Stuart:

Absolutely; it always has to be of benefit to the industry too.

Ms Lo:

It is very important that we link businesses with colleges through investment.

Parents came into my mind when you talked about communication. Are we talking to parents? Students are 14 and 15 when they are choosing GSCE subjects, and, often, mothers will recommend that their daughters choose social work or nursing rather than engineering or chemistry. Therefore, parents also need to be educated.

Ms Joanne Stuart:

I agree completely with both your points.

However, we have to acknowledge and recognise that, in Northern Ireland, businesses are predominantly small businesses. In the United States, large business organisations are able to put more investment into colleges. We have to find ways of engaging smaller organisations. For example, we are suggesting that, through bursaries, perhaps businesses can find some way of sponsoring the resources that are needed on STEM courses and to help towards the costs of the course for students.

It is necessary for businesses to engage with schools in different ways and for parents to be educated about STEM subjects. We must consider the people who are influencing children's decisions. Careers conventions, which we are getting more involved in, provide an opportunity to engage with pupils and their parents. However, we need to do that in much more co-ordinated way.

Dr Passmore:

That is one of the points that we discussed in the review. By engaging with not only parents but the greater community, we can increase their awareness and acceptance of STEM subjects and innovation, which has been difficult. That links into what Joanne said about using careers services to promote STEM subjects and their advantages. To ensure that that happens, we must bring everyone together and focus on public relations. I am working again with MATRIX, which is trying to raise awareness of the benefits that new products that are linked to science and technology can bring to the economy and society.

Mr McClarty:

I thank Joanne and Clare for their presentation. Joanne, you introduced Clare as "Dr Clare Passmore", but in our notes the only doctors mentioned are the two males.

Ms Joanne Stuart:

I think that I told the Committee Clerk that Clare was coming, but I probably did not say that she is a doctor, so I apologise to Clare.

Mr McClarty:

My question relates to Clare's point about the lack of interest, seemingly, from the primary school sector. That is where children learn the basics and develop the interests that will carry them through their lives. Is there any way that primary school principals can be incentivised to

place a greater emphasis on STEM subjects? Will you give us a bit more information about that initiative in the north-east of England?

Dr Passmore:

The quick way to incentivise principals is to make science compulsory. If science is mandatory, pupils have to engage with it. However, that is a very negative way to get acceptance, and that is why we were disappointed that science was dumbed down in the revised curriculum. Making science a compulsory subject is definitely one way to move the issue forward.

The other way, which is linked to continuing professional development (CPD), is to challenge the perception that science is difficult. That is the fundamental reason why children and society in general do not engage in science. That perception is down to a misunderstanding. It must be remembered that children up to the age of 11 are taught in primary schools. Therefore, teachers are teaching science that is for children up to that age. Most people in society, teachers as well as students, should be able to understand science to that level. The issue comes back to how teachers are trained to overcome the perception that science is difficult and how CPD can help to move that forward.

That perception is cultural. However, by getting head teachers engaged, we can show them that science has a softer side. Those of us who have studied science know that, and Joanne touched on this point earlier, it is not just about learning what happens when two things are added together or understanding complex ideas and that it requires other skills.

Caron Malone said earlier that, apart from the learning professional skills, she also learns organisational and problem-solving skills. I noticed that when the primary 6 and primary 7 children came to the Long Gallery, they said on interrogation that they were frightened when they started their projects, but that they became more comfortable the more they worked at them. It is a question of overcoming those difficulties and rising to a challenge. A great deal of that is common with STEM subjects. Primary head teachers will become engaged when they understand that STEM subjects provide skills other than numeracy and so forth.

Ms Joanne Stuart:

It is also a question of bringing multiple subjects together. Children studying STEM subjects work with programmes such as Young Enterprise, which is about entrepreneurship. Studying

STEM subjects does not mean that people are going down just an academic route; they could be studying STEM subjects with business studies or art because they want to be able to apply that knowledge. That cross working must be encouraged.

We are examining the north-east STEM partnership. I do not have a lot of detail about it, although we will be getting that information. However, it looks as though businesses there have come together. An issue for the business sector is communicating with a lot of schools so that it gets across its message about the opportunities and the sorts of skills that are needed in each sector. That is why the workforce development forums in the regional colleges, where there is the right engagement with business, work well in Northern Ireland. Again, the issue is to get more businesses engaged in the process.

In the north-east STEM partnership, businesses came together and recruited teachers to go into schools, make presentations and work with careers teachers. It is about thinking smarter and about how to get the most out of the funding, time and resources. However, I will get more information on that partnership.

Ms Lo:

Clare is right; this is a cultural issue. In the Far East, people in China, Japan and Korea are going for STEM subjects. That will make us much less competitive. Students in developing countries are encouraged greatly to study those subjects.

Mr Hilditch:

Thank you for your presentation. I understand that there will be a written response, and, perhaps, a further event when we can get into more detail. Perhaps DEL will provide more detail and reasoning behind the recommendations in the report, particularly recommendation 13, which deals with reducing barriers to obtaining financial support for students studying STEM subjects.

Ms Joanne Stuart:

That recommendation is also part of the issue of creating incentives for people to study STEM subjects. We are trying to develop scholarships with the business sector, but they need to be promoted to children when they are much younger rather than when they have made career choices. I examined the issue from a variable fees perspective, and fee charging and bursaries and so forth could be examined. More work needs to be done on that and on how we encourage

young people to study STEM subjects. We have to find different levels of support from businesses, because not all businesses can afford fully to provide a bursary. However, there might, for example, be a golden hello for students when they graduate. The issue can be looked at in different ways, but it is particularly important.

Mr Hilditch:

Perhaps we will get the chance to look at it in detail.

Ms Joanne Stuart:

Yes.

The Deputy Chairperson:

Thank you for coming along and giving your presentation. The Committee will, no doubt, meet you again.