

Report of SSAC Science Education Workshop 14 December, University of Glasgow

1. Introductions

Professor Jim Hough

Professor Hough welcomed the delegates¹ to the University of Glasgow for the SSAC Science Education Workshop², outlining some of the concerns and challenges that have been recognised in relation to delivering high quality, modern and relevant science education in schools. He stressed that the SSAC considered that there was a need for different sectors, especially universities and business, to work together to support and make life easier for those delivering high quality science education to Scotland's young people.

Professor Anne Glover

Professor Glover remarked that science, engineering and technology were not only essential for driving our economy – now and in the future - but were also significant parts of Scotland's heritage and culture.

She reported that the Scottish results in the *Trends in International Mathematics and Science Survey (TIMMS³)* report published in December 2008 had highlighted failings in maths and science in Scotland's schools "where Scotland was standing still while other nations pushed by and rose up the league tables".

In response the then Cabinet Secretary for Education and Lifelong Learning had convened a School Science Summit⁴ on 5 May 2009 which focused on how science could be made more engaging for pupils and how the skills and confidence of teachers could be improved to make this a reality. Following the summit, the Scottish Government launched the **Science & Engineering 21 – An Action Plan for Education⁵**. The Action Plan paves the way for stimulating ambition in the teaching and learning of science, engineering and technology, encouraging more young people to consider a career in science and engineering and raising public understanding of science.

Professor Glover reported that she had agreed to Co-Chair the **Science and Engineering Education Advisory Group** with Mr Ian Wall. She explained that the Advisory Group which was made up of representatives from education, academia and industry would ensure that a wide range of stakeholders had the opportunity to contribute to making the aspirations of the Action Plan a reality.

Professor Glover explained that the new Curriculum for Excellence⁶, which was introduced in August 2010, aimed to declutter the curriculum, teach topical information and encourage children to understand concepts rather than facts. She

¹ Delegate list is at Annex A.

² Workshop Programme is at Annex B.

³ <http://www.scotland.gov.uk/News/Releases/2008/12/09163549>

⁴ <http://www.scotland.gov.uk/Topics/Education/Schools/curriculum/ACE/Science/sciencesummit>

⁵ <http://www.scotland.gov.uk/Topics/Education/Schools/curriculum/ACE/Science/Plan>

⁶ <http://www.ltscotland.org.uk/understandingthecurriculum/whatiscurriculumforexcellence/index.asp>

reported that the Advisory Group's four work themes aimed to build on and support the new Curriculum for Excellence. The four themes being:

- Professional development and provision of practical support for teachers
- Increasing children and young people's engagement with, and understanding of real life science, engineering and technology;
- Further learning, training and employment in STEM
- Improving the public knowledge, understanding and perception of science

Professor Glover explained that there was a need to work in a much more cross-disciplinary way and that she had asked SSAC members to undertake a piece of work which would consider how to better improve the links between schools, universities and business. Professor Glover noted that the business community had a very important role to play in supporting science education.

2. Setting the Scene

Representatives from business, universities and schools set the scene for later discussion by considering how schools, universities and industry can work better together to support science education in Scotland, commenting on the drivers, barriers and challenges for engagement between schools, universities and business, and the challenges for the future to enhance the delivery of science education in Scotland.

2.1 A View from the Universities

Professor Nigel Brown, Vice Principal and Head of the College of Science and Engineering, University of Edinburgh & Chair of the Deans of Science and Engineering in Scotland

Professor Brown noted that the Deans of Science and Engineering were currently engaged in discussions around supporting the development of the new Curriculum for Excellence.

He noted that a major driver for enhanced engagement between universities and schools was to contribute to the development of the new Curriculum for Excellence. He noted that as we live in a technological age, science, engineering and technology are important for everyone – and that it is vital that we produce a scientifically literate population as well as the scientists and engineers of the future.

Professor Brown commented that from his experience engagement between individual members of university staff and students and individual teachers in schools worked very well and was tremendously helpful in building interest in STEM subjects in schools as long as the interactions and engagement were sustainable. He reported that well-funded and well-resourced professional groups could provide excellent support for teachers. He cited the SCI-FUN roadshow and the Researchers-in-Residence scheme as examples. He also reported that organisations such as the Society for General Microbiology and the Institute of Physics provided excellent opportunities for engagement between schools, universities and business. Professor Brown added that a number of professional bodies and institutes also accredit degrees and provide universities with advice on the skills that businesses are looking for in new graduates.

Professor Brown suggested that there was an opportunity for companies to engage with universities more on teaching and on curriculum development. He highlighted an example from a School of Engineering whereby contributions from a number of companies are pooled to support the training of a number of students. Through this engagement these companies are able to articulate their needs and to influence the development of the curricula.

Professor Brown commented that one of the major barriers to engagement was lack of funding. He also suggested, however, that the current overly-compartmentalised nature of subject areas, in many cases for the convenience of assessment, was a barrier for engagement. In order to meet the needs of businesses, universities need to develop more interdisciplinary skills. He added that there is also a need to enhance and develop mathematical skills and competence to underpin science and engineering.

Professor Brown concluded that Scotland needs to better engage learners and help to build key skills. He commented that there is a great opportunity to work more effectively together to build a continuum of education which can train individuals who will be the scientists of the future as well as the entrants to other careers and professions.

2.2 A view from Business

Dr Allan Colquhoun, University Liaison and Emerging Technologies Manager, SELEX Galileo

Dr Colquhoun noted that business was driven by shareholder value and that high tech businesses are totally reliant on the talent of their employees who add value through their intellectual effort. Talented employees are therefore valuable assets for any company. Therefore from a business perspective the most valuable thing that universities produce is skilled science, engineering and technology graduates

He added that the most important input to universities is the output of schools and that it is in the interest of business to encourage more students to study STEM subjects particularly physics and mathematics. Businesses want to improve the quantity and quality of the gene pool in schools and universities and in particular would like to see more of a gender balance in engineering and physics subjects.

Dr Colquhoun provided a number of examples of positive engagement:

- SELEX has sponsored *Rampaging Chariots* as a vehicle for exposing children to a hands on STEM project,
- SELEX offer work experience to school pupils.
- SELEX offers MEng placements – a 3 month summer placement after 3rd year followed by a 6 month academically assessed project as the first semester of the 5th year. Students get paid, get experience of a real job and get credits towards their degree.
- SELEX supports Engineering doctorates – “*A PhD in industry*” which promotes real knowledge transfer.

He commented that SELEX is beginning to see a positive effect of exposure to this range of activities through the various cohorts of students that have taken part. He added that the most effective and shortest feedback comes via the MEng students. He also suggested that there was scope to extend the MEng model to the sciences, particularly physics.

Dr Colquhoun highlighted a number of barriers to successful and meaningful engagement between schools, university and business. He suggested that there were too many overlapping and disconnected initiatives across Scotland. He added that there were no financial incentives available to companies to offer industrial placements to university students.

Dr Colquhoun suggested that there was a lack of recognition by the Funding Councils that the greatest impact made by universities is through the production of talented graduates, not through the publication of research in peer reviewed journals.

Dr Colquhoun raised the possibility that the cross subject emphasis in CfE might lead to “fun topics” being absorbed into mainstream education, thereby losing some of their inspirational flavour.

Dr Colquhoun concluded with some of the challenges for the future and considered what Scotland needs to do to enhance its provision and delivery of science education. He referred to the Engineering UK 2011⁷ report which provides an analysis of the evidence base across the science, technology, engineering and mathematics (STEM) continuum, highlighting a few key factors including:

- The demographics are against us – the 18 yr old population is shrinking until 2020
- The gender balance isn't changing in STEM subjects
- The UK has the lowest proportion of female engineering professionals in Europe

2.3 A view from Schools

**Ronna Montgomery, Institute of Physics - Physics Teacher Network Team
Leader in Scotland, Bearsden Academy**

Ronna Montgomery noted that the Institute of Physics (IoP) invests £100 per year for every physics teacher in the UK and Ireland. The IoP provides support for teachers right across Scotland, where the Physics Teachers Network organises and coordinates local CPD events for teachers, and helps to forge better links between school sectors, and between schools and higher education (HE). The Network also acts as a source of information about local initiatives and activities, and generally provides help and advice in response to requests from teachers. She added that around two thirds of physics teachers in Scotland (approx. 700) engage with the network.

She commented that the Network was supportive of the new Curriculum for Excellence, although the methodologies that were being advocated were not entirely

⁷ http://www.engineeringuk.com/what_we_do/education_&_skills/engineering_uk_11.cfm

new. She acknowledged that there was still much to be done in terms of embedding CfE across subjects and schools across the science subjects. Ms Montgomery highlighted the need to consider mathematics along with the sciences as maths is a tool that is required across all science subjects, but these skills are not being recognised and transferred.

Ms Montgomery noted that there was a particular problem attracting girls to continue to study physics and engineering subjects post 16. She highlighted a resource pack⁸ produced by the IOP for teachers interested in understanding and removing the barriers to girls in physics, through a practice-based inquiry process.

She commented that some of the barriers to improving the gender imbalance were not related to the sciences, but by school management and insufficiently informed guidance staff, where they are unaware of the importance of science subjects and the relevance of science to a range of modern careers. Ms Montgomery suggested that compartmentalisation was also an issue. She added that some students find the transition from higher to advanced higher very difficult and/or the transition to university very difficult – which leads to students dropping out at different stages. She commented that young people in Scotland move onto university quite early in comparison to many other EU countries and that developmentally they are not always ready for that transition.

She reported that time out of school undertaking placements and work experience in businesses and elsewhere provided a great opportunity for young people, but that there was an increasing amount of time spent out of the classroom which made it difficult to ensure that sufficient progress was made with academic studies. She suggested that there was (dead) time between the end of the exams in 6th year, and the end of the academic year for S6 to gain work experience. She suggested that it might be a more efficient use of time to have business people to visit schools so that a minimum number of classes would be missed. Ms Montgomery highlighted the STEM Ambassador scheme as a good model that could be more widely used.

Ms Montgomery suggested that teachers need to better understand the needs of business and universities to be able to advise and enthuse students. She also commented on the need for schools and universities to engage with each other – primary and secondary – to allow young people to lay down paths along which they would progress and then proceed to higher education.

Ms Montgomery suggested that we need to prompt the Government to “*watch the curriculum*” - as a coherent approach is needed across Scotland. Pupils should not be forced to make their subject choices too soon, without fully understanding the consequences and curricular models should not disadvantage pupils transferring between schools.

⁸ http://www.iop.org/education/teacher/support/girls_physics/page_41593.html

2.4 A view from STEM-ED Scotland

Dr Elsa Ekevall, Project Manager/Research Co-ordinator, STEM-ED Scotland

Dr Ekevall outlined two areas which act as the key drivers for better engagement between schools, universities and business:

- Engaging and informing young people (and their parents), especially where outdated views of, for example, careers in engineering still exist;
- Developing people and improving the transition from school education

Engaging and informing young people

- Sustaining future people flow into science and engineering careers by enthusing young people about the creative process, issues, aspirations and outcomes of research and industry.
- Research⁹ shows that young people in developed nations recognise the contribution that science and technology make to society and acknowledge their importance now and in the future. Yet few view the study of science and technology as leading to interesting careers.
- One of the barriers to young people pursuing science and engineering is their lack of awareness of the diverse range of careers associated with science and engineering. Schools require better images and role models of modern scientists and engineers.
- Enabling pupils to make informed decisions regarding the choice of university degree and future careers, so they do not drop out of university.

Developing people and improving the transition from school education

- Improving the transition into university and into the workforce. Industry and universities are looking for young people who have the ability to apply theoretical knowledge to real problems.
- “Keeping up with the curriculum” - universities and industry will have a greater understanding of what is required for pupils to make a successful transition from school to university if they are better engaged in curriculum development. Schools need to be better linked in to campaigns and activities to promote science and engineering to young people.
- Teacher CPD - building links with the universities and industry, who provide an external stimulus and support for developing new ideas and can provide up to date careers support for teachers to better understand modern careers in business.
- Improving young people’s experiences of science and engineering - relevance to everyday life, developing more interactive teaching/learning approaches, enhancing the existing syllabus, re-framing scientific tasks by giving pupils problems to solve and incorporating skills that are important for both engineers and scientists. Young people want to be able to apply their knowledge to real-life challenges and want to be prepared for jobs that do not yet exist.

The barriers to successful and meaningful engagement:

⁹ <http://www.gla.ac.uk/departments/stem/projects/the%20rose%20survey%20in%20scotland/>

- The competing demands and limited time within all three sectors – in schools pressures from the normal pattern of the school year (teaching and assessment schedules) and workload priorities; in universities pressures from competing demands of teaching and research; in business time is a big problem especially in SMEs.
- Reward/recognition – for universities this aspect of work has not been rated highly in the RAE (Research Assessment Exercise) or currently in REF (Research Excellence Framework). The move towards measuring impact may improve this situation.–
- There are many really great things happening on a small scale but all too frequently only benefit schools already engaged and involve the same people from industry and universities. There are many local and regional pilot projects, but there are usually difficulties with increasing participation in these initiatives and embedding them in the system.
- A stimulus to action by providing a common space (real and metaphorical) for meeting and discussion and encouraging activity and collaboration
- There is a need for enabling structures to be established and sustainable support from institutions and organisations.

The challenges for the future:

- There is a need for real changes in policy and in the provision of mechanisms to bring about successful change to promote better interactions between schools, universities and business.
- There is a requirement to build sustainable and continuous links between schools and universities and industry by implementing structures for meaningful dialogue and the promotion of school-university-industry partnerships rather than teacher and lecturer led-partnerships (often set-up on an ad hoc basis between individuals). Sharing of resources could help promote such interactions and ensure that they are two-way dialogues.
- There is real scope to building capacity across Scotland, for example through enhancing
 - STEM Ambassadors
 - Researchers in Residence
 - Support for Advanced Higher and the Baccalaureates
 - Glow

Dr Ekevall concluded that Scotland is relatively small with a less complex educational system than in many other countries. Curriculum for excellence provides the opportunity to do things differently. The potential benefits of sustained meaningful engagement are immense, but the barriers must be addressed.

3. Discussion

Led by Dr Martin Hendry, Senior Lecturer in Astronomy, University of Glasgow and STFC Science in Society Fellow

Dr Martin Hendry led the group discussion session, challenging the delegates to consider their comments and contributions around three questions:

- : ***What three things should Scotland do to enhance science education links between schools, universities and business to support the delivery of the curriculum for excellence?***
- : ***What needs to be put in place to achieve this; and***
- : ***What can Scotland learn from elsewhere?***

The main points raised in the discussion are listed below.

Better Engagement

- Developing the appropriate skills in our young people is critical to schools, universities and business. We need to build an effective dialogue around this area to understand what these skills are and how they can be best delivered.
- There is a need to bring schools, universities and business together to fully consider the issues and to understand what they can do to assist each other to deliver both the scientists of the future as well as a scientifically literate population. There also needs to be a shared understanding of the benefits to each sector of better engagement.
- There needs to be a clear route for engagement between business, academia and schools in relation to the development of the CfE, qualifications and skills.
- Businesses need to engage with schools and universities to influence the training of the work force of the future. All sectors of business need to engage with schools and universities.
- Is GLOW a tool that could be used to enhance engagement? Access to GLOW was highlighted as a limiting factor as many teachers. It is not available to business and universities. GLOW tends to be viewed simply a repository for ideas activities and a communication tool. There is scope to do much more with GLOW.

Academic incentives and rewards

- There needs to be a recognition/reward system for academics who undertake interactions with schools and/or public outreach activity. Academics also need to be given adequate time to carry out these activities.
- Universities are currently facing many challenges and schools activity is often delivered by the good will of a number of individuals through personal contacts. At a time of financial constraint and decreasing student places why should Universities invest in this type of activity? Academics are currently rewarded for publishing papers not for participating in schools/public outreach activity. The Funding Council needs to better understand the wider benefits from these interactions.

- RCUK (and the individual Research Councils) recognise public engagement/schools activity through various grant and fellowship schemes. For example, STFC funds a Science and Society Fellowship scheme. The impact element of the new REF should also recognise public engagement/schools activity.

Work Experience

- Local authorities have stopped funding work experience for 4th year pupils. If pupils want to undertake work experience they have to arrange it themselves. There is concern that some 4th year pupils don't have sufficient knowledge to get the most out of work experience placements.
- A multi pronged approach to work-experience is required, i.e. there is a need to inspire students in 4th year to continue to do science at an advanced level however there could be the opportunity for more serious "work" placements/experiences for 5th/6th year pupils after the exam period in June when students are normally released from school.

Teacher CPD

- There is a small group of enthusiastic teachers who regularly attend CPD events aimed specifically at science teachers. It is much harder to reach the 30% of teachers who do not want to engage.
- SSERC run researcher engagement days and summer schools which are aimed at teachers. These events enthuse teachers and this enthusiasm is then passed on to their pupils (and colleagues). It is recognised as a good way of hitting a large number of students.
- The McCrone agreement is currently under review. This provides an opportunity for the Scottish Government to encourage Local Authorities to increase the required minimum hours of CPD each teacher does annually.
- The increased cost of buying time out of school often prevents teachers participating in external CPD activities.
- SCDI's Young Scientists and Engineers Clubs run twilight CPD sessions for teachers on how to run a science club. These are very popular with 46 teachers attending the last session.

Mentors

- SCDI has run a project with Strathclyde University on rapid 3D prototyping technology which involved student mentors and meant that schools could use the equipment for science components as well as in other areas such as art projects.
- It is recognised that it is more important for mentors to come from a similar social background as the students than to be close in age to them.

Curriculum for Excellence

- A teacher commented that the development and implementation of CfE is slow. Teachers need a clearer idea of what universities/business want in terms of skills and how this can be delivered through CfE.
- CfE and the new qualifications all need to be put in place in schools in a short time. There were many big ideas at the start of the curriculum review process, and now there seems to be a lack of ambition and a perception that CfE is merely tinkering around the edges. We need to be ambitious for our young people and require a much bigger investment in CPD for teachers.
- Exam results are the vital link between universities and schools. This puts pressure on teachers to “teach the exam”, no matter what the wider aspirations of CfE are. We therefore need to consider the entire system of assessment too.
- What is the overall economic impact of education and the contribution of science education? The Scottish Government aspires to sustainable economic growth - this needs to be embedded in the provision of all levels of education. All Young people need to be more aware of the societal/economic impact of their subject choices.
- An interdisciplinary approach is very important to realising the aims of CfE. There is also a need to embed in the thinking of teachers, the cross curricular nature of many activities, that will help them deliver curriculum for excellence
- There is a need to bring contemporary science into schools and to promote cross-disciplinary teaching in the CfE. Universities and businesses have a role to play in supporting the delivery and provision of cross-disciplinary thinking and in contributing to the thinking around it can be assessed. Open ended investigations need to be promoted.
- There is a need to consider research on management of change in schools and requirement for coherent systems to be put in place.

STEM Activities

- There are too many small scale STEM initiatives for schools across Scotland – delivered by a range of providers. What works well in one part of Scotland may be good, but unless it can cover all Scotland it will never be good enough. There is a need for a systematic approach to see effective activities rolled out over Scotland and to understand how they can support formal teaching activities in the delivery of curriculum for excellence. Overall there is a need to join up STEM activities better across Scotland, this could be promoted by an initial audit of STEM activities.

Other Countries

- Finland and Singapore were cited as examples of countries where there is a much bigger requirement for teachers to do more hours of CPD. Scotland needs to invest in more professional support for science teachers in order to support change.

- What can Scotland learn from Finland? Academics have a much bigger involvement in the schools system i.e. academics oversee the exam process for secondary pupils.

Financial Resources

- There is a real need to invest to ensure success.. However it is recognised that in the current economic climate, that identifying additional funding from the public purse will always be a challenge.
- Too often the deliver of STEM activities relies on the goodwill of specific individuals. This is no substitute for proper resourcing and adequate funding.
- Could business provide more financial support for schools? SCDI's Young Engineers and Science Clubs are 98% funded by industry. Scotland's business profile (98% of businesses in Scotland have less than 50 employees¹⁰) may not be able to provide funding individually but could help for example by providing stimulating positions for teacher and student placements.

4. Conclusion

It was very evident that there is a great deal of enthusiasm from schools, universities and business to work together in a more joined up way to deliver an enhanced science education experience at all levels. The importance of school-university interactions needs to be recognised and encouraged at a number of levels as this type of engagement can have a very positive impact on both teachers and pupils. Likewise for business-school interactions for example through work experience for teachers and pupils. However there are a number of concerns that need to be addressed to ensure that Scotland is not left behind in its provision of a modern and relevant science education for its young people.

There is a concern that **assessment** at schools is not being adequately considered in relation to the Curriculum for Excellence. Greater clarification is required. There is a need for better co-ordination of:

Careers advice for young people. This relies on a better understanding of the importance of science and engineering to the careers of today and the careers of tomorrow. Business has a significant role to play in advising on their requirements.

Science-specific CPD for teachers. It is important that teachers have deep knowledge and understanding of modern science and engineering to allow them to reinvigorate teaching. There are opportunities for business and universities to contribute to CPD in science and engineering which should be available across the whole of Scotland.

¹⁰ <http://www.scotland.gov.uk/Topics/Statistics/Browse/Business/Corporate/alltables>

Curriculum for Excellence support across science subjects. Teachers need greater guidance on implementation of the CfE across the science subjects, including for example, cross-disciplinary teaching. Universities and business are well-placed to advise and provide examples of real-life, relevant examples that could be adapted for use in the class room for example as open ended investigations. There is a need for coordination of exemplar materials for a typical CfE course to provide inspiration for teachers to create their own range of materials.

Curriculum development, with opportunities for greater input from universities and industry at all levels.

Financial support from industry for science-related activities at schools, e.g. teacher CPD and STEM activities for young people. There is a need for organisations to work more closely together and to consider the intended impact of their contributions on both pupils and teachers.

There was agreement that there is a need to **invest now** for the future of science education in Scotland, and a recognition that there are no cheap fixes. Longer term and sustainable investment will be required.

5. Concluding Remarks

Professor Hough thanked participants for making the time to come along to the workshop and for their contributions to the debate. He gave additional thanks to the individuals who had given presentations which helped set the scene and to Dr Hendry for chairing the discussion. A note of the meeting would be circulated round all participants and a follow up meeting would take place to consider workable solutions to some of the issues identified.

**SSAC Secretariat
December 2010**

Annex A

**SSAC Science Education Workshop: 14 December, University of Glasgow
Delegate List**

Name	Title	Organisation
Professor Nigel Brown	Vice-Principal and Head College of Science and Engineering	The University of Edinburgh
Dr Allan Colquhoun	University Liaison and Emerging Technologies Manager	SELEX Galileo
Mr Frank Creamer	Policy Executive Learning Directorate	Scottish Government
Dr Avril Davidson	SSAC Secretariat	Scottish Government
Dr Elsa Ekevall	Project Manager/Research Co-ordinator	STEM-ED Scotland
Ms Wendy French	Primary Teacher	Sciennes Primary School/Learning and Teaching Scotland
Professor Anne Glover	Chief Scientific Adviser	Scottish Government
Professor Colin Graham	Professor of Experimental Geochemistry; Convenor of Scottish Earth Science Education Forum (SESEF)	The University of Edinburgh
Ms Janette Harkess	Director of Policy and Research	Scottish Council for Development and Industry
Dr Martin Hendry	Senior Lecturer in Astronomy	University of Glasgow
Professor Louise Hayward	Professor of Educational Studies	University of Glasgow
Mr Nick Hood	Physics Teacher	Kirkcaldy High School
Professor Jim Hough	Kelvin Professor of Natural Philosophy and SSAC Member	University of Glasgow
Ms Moyna Kennedy	Consultant	STEMnet Scotland
Professor Andrew Long	Head of the School of Physics	University of Glasgow
Professor Mandy MacLean	Dean of Graduate Studies	University of Glasgow
Ms Jane Martin	Project Manager - Young Engineers and Science Clubs Scotland	SCDI
Mrs Anna Milne	SSAC Secretariat	Scottish Government
Professor Stuart Monro	Scientific Director	Our Dynamic Earth
Ms Ronna Montgomery	Physics Teacher Network Scotland	Bearsden Academy
Professor Marian Scott	Professor of Environmental Statistics and SSAC Member	University of Glasgow
Mr Stuart Sharkie	Engineering Manager, Optronics and Land	Thales UK
Professor Alyson Tobin	Dean of Science	University of St Andrews
Mr Ian Wall	former Chief Executive Officer of the EDI group	
Ms Joanne Ward	Policy Executive, Office of the Chief Scientific Adviser	Scottish Government
Mr Fred Young	Chief Executive	SSERC

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Programme

5.00pm	Welcome, Professor Jim Hough , SSAC
5.05pm	Introduction, Professor Anne Glover , SSAC
5.10pm	Setting the Scene
	<i>A view from the Universities</i> Professor Nigel Brown , Vice Principal and Head of the College of Science and Engineering, University of Edinburgh & Chair of the Scottish Deans of Science and Engineering
	<i>A view from Industry</i> Dr Allan Colquhoun , University Liaison and Emerging Technologies Manager SELEX - Galileo
	<i>A view from Schools</i> Ronna Montgomery , Institute of Physics - Physics Teacher Network Team Leader in Scotland, Bearsden Academy
	<i>A view from STEM-ED Scotland</i> Dr Elsa Ekevall , Project Manager/Research Co-ordinator, STEM-ED Scotland
5.40pm	Breakout Groups Facilitators: <ul style="list-style-type: none"> o Dr Martin Hendry, University of Glasgow o Wendy French, Learning Teaching Scotland & Sciennes Primary Edinburgh o Stuart Sharkie, Thales Glasgow
6.30pm	Group Feedback
6.40pm	Open Discussion Identification of Key Issues, Prioritisation and Next Steps
7.00pm	Workshop Ends