

Learned Societies' Group on Scottish Science Education

Summary of Launch Event, held at the RSE on 28 May 2012

Programme

Opening remarks and presentations were provided by:

Professor Sally Brown OBE FRSE, Chair of the Learned Societies' Group on Scottish Science Education

Professor Muffy Calder OBE FRSE, Chief Scientific Adviser for Scotland

Dr Ian Wall FRICS HonFRIAS, Chair of the Science and Engineering Education Advisory Group (SEEAG) (now STEMEC)

Followed by a panel discussion session involving those above and:

Dr Janet Brown FRSE, Chief Executive of SQA

Professor Graham Donaldson CB, Leader of the Review of Teacher Education in Scotland

Marie McAdam, HMI National Specialist in science, Education Scotland

Stephen Wright, Faculty Head of Science at Deans Community High School

Introduction from Professor Sally Brown, Chair of the Learned Societies' Group on Scottish Science Education

The launch event was an opportunity to raise awareness of the establishment of the Learned Societies' Group on Scottish Science Education (hereafter referred to as the 'standing group'). It was also a way in which the standing group could improve its understanding of the current reforms underway in Scottish school education, the priorities for those who work in a variety of ways in that field and the implications for science.

The standing group has purposes arising from concerns about, and a need to contribute to, the major reforms in the delivery of science education in Scottish schools. The group comprises representatives from the Royal Society of Chemistry, the Institute of Physics, the Society of Biology, the British Computer Society, the Royal Society of Edinburgh, the Association of Science Education, the Scottish Schools Education Research Centre and the Engineering Policy Group Scotland. A strong connection with the Science and Engineering Education Advisory Group (SEEAG) (now STEMEC) has also been established and a focus of the launch was on that group's report, *Supporting Scotland's STEM Education and Culture* (2012).
<http://www.scotland.gov.uk/Topics/Education/Schools/curriculum/ACE/Science/SEEAG>

While the constituent organisations that make up the standing group are individually active in this area, it is likely that more can be achieved by a formal collaborative grouping that identifies, discusses and takes action on common issues. Its three-fold remit has been formulated, as follows:

- To be proactive in identifying and promoting priorities for school science education in Scotland and to liaise, where appropriate, with other relevant organisations and groups;
- To consider and monitor school science education initiatives or developments, particularly those from Government and its agencies, and respond to these where appropriate; and
- To organise, where appropriate, meetings or other events that stimulate debate on school science education in Scotland.

Implicit in the group's remit is the intention to foster relationships, share events and provide advice to policy makers and other relevant bodies in co-operation with a broader range of STEM-related learned societies and professional associations.

In this context, an emphasis on collaborative interdisciplinary and cross-curricular study is a major strand of the Curriculum for Excellence. The traditional sciences of physics, chemistry and biology have to consider much more explicitly than in the past how they can contribute to the multi-disciplinary aspects of future STEM education, how their relationships with other disciplinary areas of the curriculum will change and how their subjects will gain from the wider collaboration.

Professor Muffy Calder, Chief Scientific Adviser for Scotland

Professor Calder welcomed the establishment of the standing group and the role it can play in ensuring coordination of activity, an important thread running through the SEEAG report.

From the Scottish Government's perspective, it wants to foster positive working relationships in this area. Responding to the SEEAG report, the Government is committed to funding the Scottish Schools Education Research Centre (SSERC) for the next three financial years from (2012/13 to 2014/15), including supporting work designed to increase the confidence of primary teachers in science. The Government is also taking forward plans to establish co-ordinator posts in order improve coherence in science CPD.

In her position as Chief Scientific Adviser for Scotland, Professor Calder wants to ensure that science is at the heart of government and that science plays a prominent role in driving the economy. As strong science education base is central to both these strands.

From a personal perspective as a computer scientist, she was of the view that Curriculum for Excellence provides an excellent opportunity to embed the teaching of computing science in school. In this context, she referred to the joint project between the Royal Society of Edinburgh and the British Computer Society which is

exemplifying aspects of Curriculum for Excellence through the development of teaching materials for Computing Science.

http://www.rse.org.uk/1034_ComputingScience.html

Dr Ian Wall, Chair of the Science and Engineering Education Advisory Group

Dr Wall gave a presentation (enclosed at the end of this summary) which provided an overview of the SEEAG report. The report considers a wide range of issues around science education and engagement, identifies the research evidence about what works in improving science education and engagement, and draws conclusions and makes more than sixty recommendations about ways forward. The need to provide professionals with confidence and support is at the core of the SEEAG proposals.

Much of that which is evidenced and recommended in the report has been recommended before, but it is developed and presented within the report in the particular contexts of STEM education and engagement as well as the Curriculum for Excellence. This clearly indicates that implementation of the recommendations will be key.

While implementation of some of the recommendations will inevitably require additional expenditure, the vast majority of the recommendations do not stem from a need for additional funding. It is much more about the way in which the STEM education community organises itself than about funding. This will require organisations and individuals to work in an integrated way in order to ensure a better-coordinated and system-wide response. As such, successful implementation of the recommendations will require high levels of administrative cooperation.

Dr Wall confirmed that SEEAG, under the new name of STEMEC, will continue to advise and support the Scottish Government and others in relation to the implementation of the report's recommendations. STEMEC will have a role in mobilising other organisations but it will not lead or direct their activities.

Discussion session

- Professor Muffy Calder and Dr Ian Wall formed a discussion panel with:
- Dr Janet Brown, Chief Executive, Scottish Qualifications Authority
- Professor Graham Donaldson, Leader of the Review of Teacher Education in Scotland
- Marie McAdam, HMI and the National Specialist for Science, Education Scotland
- Stephen Wright, Faculty Head of Science at Deans Community High School

Professor Sally Brown chaired the discussion session which is summarised, as follows.

Teacher confidence in primary school science has been highlighted as a concern in Scotland. The Report of the Review of Teacher Education in Scotland (2011): <http://www.scotland.gov.uk/Publications/2011/01/13092132/0> recommended that the traditional BEd degree should be phased out and replaced with degrees that combine in-depth academic study in areas beyond education with professional studies and

development. Concern was expressed that an increasing emphasis on those undertaking initial teacher education to experience wider academic study and learning could reduce students' exposure to scientific pedagogy. It was, however, argued that the Review of Teacher Education promotes the notion of career-long learning which calls upon a greater role for universities as a whole in building learning capacity and developing teachers in a more rounded way and with greater depth.

Concern was expressed about the demands being made upon teachers' time, particularly at a time of major reform in school education, including the continuing implementation of Curriculum for Excellence and the preparations being made for the introduction of the new qualifications. This limits teachers' ability to take up opportunities post-Initial Teacher Education (ITE) that would strengthen and refresh their subject knowledge.

Teacher workload issues were recognised as being particularly difficult at the current time. It was argued that this requires effective school leadership and planning to provide teachers with opportunities for development time. Given the resource constraints, it is important that any development and training opportunities are of high quality to ensure that the best use is being made of teachers' precious time. It was, however, recognised that even when time can be found for teachers to strengthen their subject knowledge, it can be difficult for them to take up such opportunities because resources are not available to employ supply staff to cover teaching commitments.

It was advocated that given their resources, knowledge and experience, the learned societies, universities and colleges could play an important role in providing teachers with practical support and inspiring materials. Given the diversity of practice envisaged under the Curriculum for Excellence, the benefit of professional learning communities in terms of improving collaboration and sharing of ideas was also highlighted.

With specific reference to the materials being developed by the RSE/BCS Computing Science exemplification project, the teachers involved in the trialling of the materials had appreciated the opportunity that this provided for professional dialogue and two-way communication.

A question was raised in terms of what can be done to enhance the teaching profession to enable it to attract the best STEM graduates. Comparison was made with the way that the teaching profession is perceived in Finland. While it is not the best paid profession, in Finland teaching is seen as being one of the best careers because of what it means to be a teacher. It was recognised that in Scotland there is a need to raise the profile of the teaching profession and its critical role in society. Lessons could be learned by examining the approaches taken in other countries, including Finland. As part of this process, the SEEAG report recommended that the Scottish Government should adapt a programme to Scotland with similar aims and aspirations to the Teach First Programme, which transforms exceptional graduates into effective and inspirational teachers.

It was recognised that it is important not to underestimate the wide ranging contribution made by Scotland's colleges in developing the STEM agenda. The strong engagement between schools and colleges in helping the learning and teaching of

science was highlighted. It was recognised that school and college partnerships are at their most effective when there is joint planning and commitment on the part of all the partners. Colleges have also enabled pupils to undertake advanced study in different subject areas that they would otherwise have been unable to do. As well as providing a pathway to university, colleges also provide a progression path and new learning environment for those learners for whom school was not a beneficial experience.

The Royal Society of Edinburgh, Scotland's National Academy, is Scottish Charity No. SC000470

SEEAG Report

RSE

28th May 2012

- **Trends in International Maths and Science (TIMSS) Survey 2007 (published 2009)**
- **Comparison with 59 OECD countries at ages 9-10 (P5) and 13-14 (S2)**
- **Scotland's average scores in S2 maths and P5 and S2 science declined back to 1995 levels**
- **Declining attainment of Scotland's best pupils**
- **"Scotland standing still while other nations push by"
(Fiona Hyslop, then Cabinet Secretary for Education and Lifelong Learning)**

Programme for International Student Assessment (PISA) (2009)

- **Performance of 15yr olds (S4) with 65 OECD countries at 9-10 (P5) and 13-14 (S2)**
- **Scotland a mid-ranking performer**
- **Widening gap and marked social differences in achievement, declining student engagement from early secondary and relatively high levels of NEETS**
- **OECD report (2007): “Scotland could slip through the ranks. It could be bypassed economically and become more divided socially”**

Schools Science Summit 2009

- **More collaboration across profession**
- **Seamless transitions from primary to secondary**
- **Better and more creative use of ICT**
- **Closer partnerships with industry/academia**
- **Improved provision of CPD and ITE**
- **Improved image and status of science in schools**
- **Greater real world relevance in science education**

Science and Engineering Action Plan



SEEAG set up to support implementation

SEEAG Workstreams

- 1. Building the capacity and expertise of teachers**
- 2. Practical support for teachers and learners**
- 3. Increasing young people's engagement with – and understanding of – real-life SET**
- 4. Further learning, training and employment**
- 5. Improving public knowledge, understanding and perception of science**

1 & 2 merged around shared focus on professional development

Parallel Reports

- Donaldson Report “Teaching Scotland’s Future” (not specific to science) 2011**
- Royal Society “State of the Nation” report on science and maths education 2010**
- Scottish Government post-16 education report 2011**
- Scottish Science Advisory Council report “Enhancing support for schools through collaboration” 2012 (focus on industry)**

Distinct remit of SEEAG for science and engineering - early years to FE, HE and workplace, plus science in community and a continuing role in implementation

SUPPORTING SCOTLAND'S STEM EDUCATION AND CULTURE

- **Science and Engineering
Education Advisory Group
(SEEAG)**

- **Second Report: January 2012**
<http://www.scotland.gov.uk/Resource/0038/00388616.pdf>

SEEAG Report

- **132 page report**
- **61 recommendations to Government
with actions required by a wide range
of agencies**
- **Research evidence based arguments
and recommendations**

SEEAG Report: Summary of Main Points for Science Education

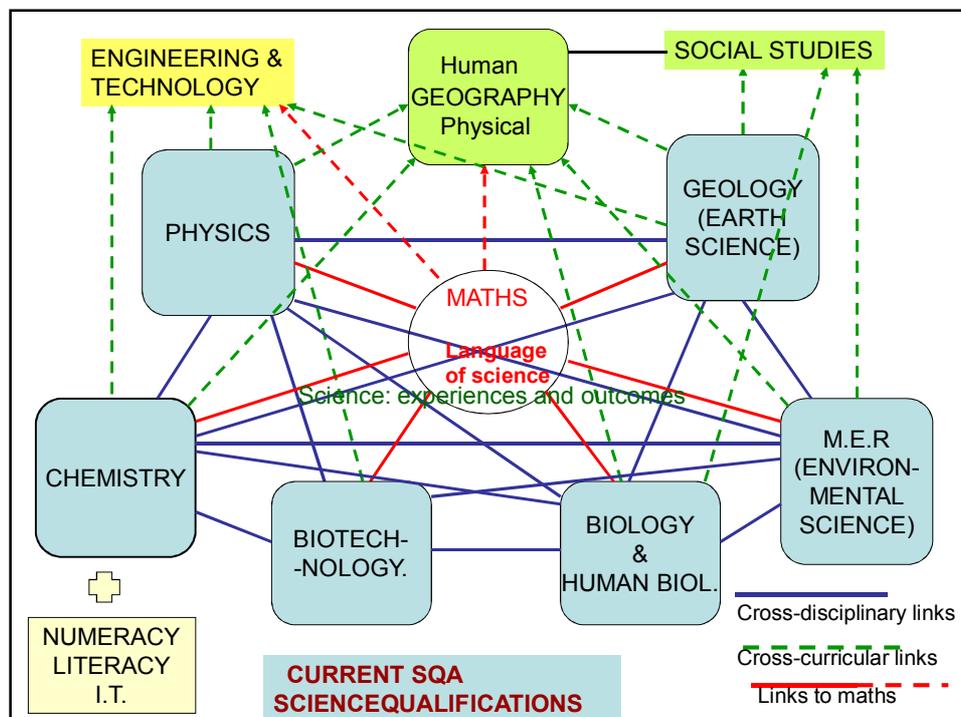
- **Teacher quality is primary factor in high performing education systems**
- **Urgent intervention needed to address poor performance in primary science and maths teaching; raise the bar for entry to ITE in Scottish universities**
- **Increased provision of CPD for science teachers (50 hrs/yr in secondary and a minimum of 15 hrs/yr for primary school teachers)**
- **Quality of CPD to be evaluated to measure its longer-term impact on learners as well as teachers**
- **Industry originated CPD to be provided through recognised and reviewed national providers**

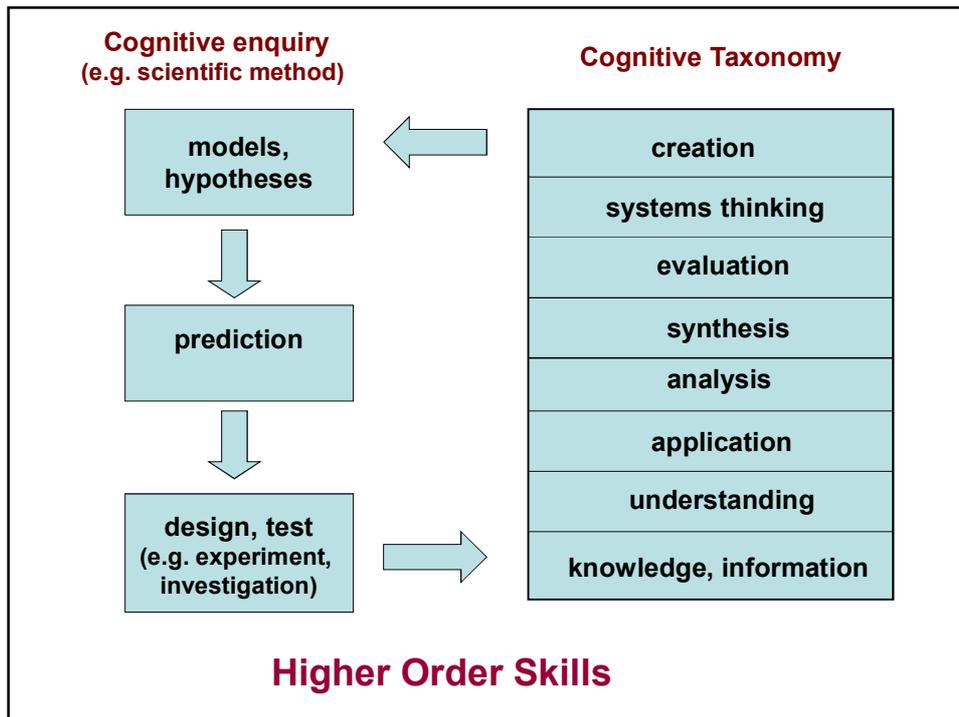
SEEAG Report: Summary of Main Points for Science Education

- **Interdisciplinary and cross-curricular science teaching is key feature of Curriculum for Excellence (CfE) - provides rich contexts and relevance, but requires to be supported by rigorous and coherent pillars of subject knowledge and understanding (pillars and lintels)**
- **Evaluating the development of pupil's knowledge and skill**
- **Narrow science subject base in Scotland (39th of 41 OECD countries) needs early and sustained redress**

SEEAG Report: Summary of Main Points for Science Education

- Peer support built around Professional Learning Communities (PLCs) within schools, at local and regional level, linked to universities, colleges, local authorities, science centres
- SSERC to expand and take the role of Scotland's national science learning centre





Science is a ‘hands on’ activity; this requires:

- that capitation allowances are appropriate to allow all pupils to carry out practical work
- that school’s physical facilities, laboratories and equipment, are of a good modern standard
- that there are sufficient skilled laboratory technicians

External support to ALL pupils, teachers and schools

- **Generation Science (primary schools)**
- **Young Engineers and Scientist Clubs**
- **STEM Ambassadors**
- **An annual visit to a Science Centre or Science Festival**

Transition to work

- **Employers and their representative bodies should take more responsibility for raising STEM career awareness and**
- **Encouraging better gender balance**
- **More flexible pathways into further and higher education STEM study and on in to STEM employment should be developed**
- **Employers to be encouraged to provide more 3-4 year apprenticeships**
- **Significant weakness in Scottish R&D leading to a loss of talent**

Wider context

Scotland best in the World

- **Science Centres**
- **Science Festivals**

But not at presentation:

- **Media Science Centre**

Implementation

- **Scottish Science Advisory Committee's 2003 Report ' *Why Science Education Matters* '**
- **many of the issues it identified remain priority concerns in 2012**
- **It is not a question of resources**

Resources

- **Primary school teachers: 23,243**
- **Secondary school teachers:**
 - **Science and Maths 5609**
 - **Computing Sciences 687**
 - **Technical subjects 1305**
 - **TOTAL 7591**

Administration

- **Of the 61 SEEAG recommendations :**
 - **23 groups or organisations are responsible**
 - **28 are a sole responsibility**
 - **31 are shared responsibilities with others**
 - **And there are the other reports to implement and the continuing implementation of CfE**

Going Forward

- SEEAG is to be renamed STEMAG and will continue to advise and support Government and others in the implementation of the Report
- Success will depend on all of us within the system working closely together to deliver the quality of STEM education Scottish pupils need and deserve.