

## **Response from the Royal Society of Biology to the consultation on the Science, Technology, Engineering and Mathematics Education and Training Strategy for Scotland.**

January 2017

The Royal Society of Biology (RSB) is a single unified voice for biology: advising government and influencing policy; advancing education and professional development; supporting our members, and engaging and encouraging public interest in the life sciences.

The Society represents a diverse membership of individuals, learned societies and other organisations. Individual members include practising scientists, students at all levels, professionals in academia, industry and education, and non-professionals with an interest in biology.

At the start of January the Royal Society of Biology in Scotland hosted a workshop in order to gather the views of the Scottish bioscience community which have fed into this consultation the response. The event was well attended with representatives from schools, universities and industry all contributing to the discussion. In addition a written response was also received from parents. We have divided our response into the main themes that were discussed during the duration of the workshop.

### **Aims Priorities and Outcomes**

1. We are supportive of the overall aims and the priorities identified for the STEM Education and Training Strategy.
2. In the opportunities for improvement the strategy highlights the need to address inequality by achieving greater diversity, we feel that the priority theme of equity could better reflect this by broadening it beyond deprivation and gender to include wider diversity.
3. The strategy document does identify the potential positive outcomes if the strategy were to be successful, however it does not indicate how this success may be measured. We would like to be involved in the development of an implementation plan, identifying what the indicators of success will be and how they will continue to be reviewed.
4. We would expect to see SSERC as an excellent providers of support for science teachers in Scotland recognised as key in ensuring the positive outcomes for the strategy are delivered.

### **Diversity**

5. The under representation of women, disabled people, and those from ethnic-minorities and low socio-economic backgrounds is a persistent phenomenon across the STEM workforce, particularly in senior roles.<sup>1,2</sup>

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<sup>1</sup> <http://www.sciencecampaign.org.uk/asset/7E74D16B%2D9412%2D4FA7%2D9CD361C8371DBD02/>

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[www.rsb.org.uk](http://www.rsb.org.uk)

Barriers preventing groups of individuals entering in STEM careers must be removed so that we can help to address the shortfall of STEM talent across the sector, and existing stereotypes within STEM careers must be challenged. Equally, barriers preventing groups of individuals from staying and advancing within the STEM sector must be addressed, for example, women are less likely to remain in the STEM sector throughout their career, in the 'leaky pipeline' effect.<sup>3</sup>

### Inspiring and preparing young people to engage in the range of opportunities provided by STEM

6. It is important that young people understand that STEM qualifications and developing STEM skills will benefit them along all career pathways. STEM skills are important not only to traditional sectors such as engineering, medicine and pharmacology but are also central to expanding sectors such as the creative industries.
7. Inspiring and engaging young people with STEM must start as early as possible and these interventions must be sustained throughout their education from primary into secondary and beyond.
8. This inspiration may come from exceptional teachers engaging their students in innovative science lessons, external speakers coming in and talking about their exciting careers, extra-curricular activities in the form of STEM enrichment clubs or experiences outside of school visiting science centres, museums and festivals.
9. The King's College ASPIRES research suggests many young people, although they may enjoy STEM subjects, choose not to pursue STEM careers and very few aspire to become scientists.<sup>4</sup> By the age of 10 many children will have decided whether science (and other subjects) are for them, so it is important that interventions begin early.
10. Appropriate diverse role models (male and female, different ethnicities, different ages, different backgrounds, different career routes) are essential not only to inspire students, but to evidence the possibility of success, demonstrating that STEM careers are open to everyone. STEM ambassadors can be an excellent source of diverse role models, and teachers should be encouraged to contact the regional hubs<sup>5</sup>. The government needs to make it clear why an additional STEM ambassador scheme is required when the UK STEM Ambassador scheme already reaches Scotland. It is important that teachers can be sure that they are able to access high quality and appropriately trained STEM ambassadors for their school.
11. There is a shortage of STEM graduates across a wide range of sectors, including science teaching. The PISA 2015 results indicate that lack of teaching staff is of concern for 45% of headteachers in Scotland.<sup>6</sup>
12. A particular challenge is the retention of teachers and more needs to be done to ensure that teachers are well supported with access to excellent professional development so that they can thrive and progress in their teaching careers.
13. If more students are to pursue STEM subjects, they must be better informed of the range of careers and opportunities within the STEM sector and understand the importance of the choices they are making.
14. STEM subjects must be embedded into the school curriculum in primary schools and teachers must be supported to teach science and technology. Many primary teachers lack the confidence to teach science and technology subjects, professional development opportunities and time invested during initial teacher training can help support primary teachers and increase their confidence. Specialist teachers could be released to support other schools within clusters who do not have a specialist. The Donaldson Review of teacher

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<sup>2</sup> UKCES Reviewing the requirement for high level STEM skills.

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/444052/stem\\_review\\_evidence\\_report\\_final.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/444052/stem_review_evidence_report_final.pdf)

<sup>3</sup> Tapping all our talents <http://www.raeng.org.uk/publications/other/tapping-all-our-talents>

<sup>4</sup> King's College London (2013) ASPIRES Young people's science and career aspirations, age 10-14

<http://www.kcl.ac.uk/sspp/departments/education/research/ASPIRES/ASPIRES-final-report-December-2013.pdf>

<sup>5</sup> STEM ambassador hubs <http://www.stemnet.org.uk/regions/>

<sup>6</sup> <http://www.oecd.org/pisa/PISA-2015-United-Kingdom.pdf>

education<sup>7</sup> highlights the importance of ensuring that our teachers receive the support that they need to become excellent subject specialists.

15. Supporting young people to engage with mathematics and increase their numeracy will enable them to better access science, technology and engineering all of which require a solid foundation in mathematics.
16. Science Centres offer informal experiences can help to engage young people with STEM. However they can be expensive to attend and not all local authorities offer schools funding to attend and many colleges do not have the same access arrangements as schools. This means a significant number of learners could be excluded from accessing this STEM resource.

### **Developing diverse pathways to enable more people to enter STEM careers/ occupations**

17. The strategy as proposed appears to focus on an academic pathway with students progressing on to university, We believe that the strategy needs to be broader and place equal emphasis on technical and vocational pathways including support for apprenticeship routes.
18. There needs to be parity of esteem across academic and vocational training pathways and recognition that apprenticeships are as valuable as degrees with both seen as equivalent opportunities, neither of which limit future career options.
19. Career opportunities should be showcased to primary students, as well as those in secondary school, and careers provision embedded in curriculum to encourage future participation in STEM subjects.<sup>8</sup> The Government should support teachers in delivering career provisions and ensuring that academic and vocational and technical pathways are promoted to students. Careers information must also be available for parents to access so that they can support their children to make decisions.
20. Up to date Careers advice during secondary school is critical, and there is a concern currently careers advisors do not understand the breadth of opportunities there are today within the sciences and how STEM skills are applicable across professions.
21. Colleges have a key role in preparing learners for the workplace, as well as in delivering apprenticeships, and in providing training in practical skills. There need to be better links made between schools, colleges, universities and employers.
22. Development of a STEM careers roadmap may assist in clarifying the different pathways and career routes available for young people, and identify how they can move from one pathway to another.

### **Ensuring the content and mode of delivery of STEM education and training provision meets the needs of industry now and in the future; including up skilling to continually develop the existing workforce.**

23. We must be preparing our students to be adaptable and flexible to meet the future needs of STEM industries. A strategic workforce plan for the lifesciences in Scotland where the current and future needs of the lifesciences could be identified and agreed upon, based on evidence could influence the skills developed in schools, colleges and universities to better meet those needs.
24. The education system cannot always keep pace with the change in skills demanded by industry, so it is important that there is an open dialogue between employers and schools, colleges and universities regarding the skills that should be being developed.
25. Work experience often provides invaluable skills for students that cannot be gained through traditional study. Employers need to be open to and commit to offering more opportunities for students to access work

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<sup>7</sup> Teaching Scotland's Future <http://www.gov.scot/resource/doc/337626/0110852.pdf>

<sup>8</sup> Reiss M & Mujtba T (2016): Should we embed careers education in STEM lessons?, The Curriculum Journal <http://www.tandfonline.com/doi/full/10.1080/09585176.2016.1261718>

experience whilst at school, college and university so that they have a better understanding of what different areas of industry may entail.

26. The Royal Society of Biology degree accreditation<sup>9</sup> schemes rigorously and independently assess programmes to ensure that degree courses have a solid academic foundation in biological knowledge and skills, as well as preparing graduates for the needs of employers. As part of the accreditation process, feedback is provided to the higher education institutions. This includes conditions that must be met before accreditation can be awarded and recommendations for enhancement of programmes raising standards of bioscience education across the sector.
27. In December 2016, 213 degree programmes at 22 universities had achieved Advanced Accreditation through the RSB and 175 degree programmes at 25 universities had achieved Accreditation. Five universities in Scotland have had their degree programmes accredited<sup>10</sup>.
28. It is important that employers invest in the training of their staff, there can often be a mismatch in the expectations of employers of the skills that their employees will have when coming out of school, college or university. Employers, especially smaller businesses must be able to access support to enable them to continually develop employees and support people along their chosen career path.
29. Professional registration is helping to raise standards within technical professions and address shortages within the technical workforce.<sup>11</sup> A number of STEM employers already support their employees to become professionally registered and many professional bodies offer professional development opportunities and professional registration. STEM employers must invest in the training of their technical staff and recognise the importance of professional development, encouraging employees to work towards professional registration.
30. The RSB, licensed by the Science Council, offers Registered Science Technician (RSciTech) status. This award offers recognition for the technical profession and demonstrates individuals meet and maintain the high standards expected of our organisation as a professional body. The RSB also provide progression to higher awards through Registered Scientist (RSci), Chartered Scientist (CSci), and our own professional register Chartered Biologist (CBiol).<sup>12</sup> For our membership to achieve registration status they must demonstrate evidence of meeting the standard for key competencies as well as a commitment to undergo continuing professional development.

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<sup>9</sup> Degree accreditation <https://www.rsb.org.uk/education/accreditation/>

<sup>10</sup> All accredited programmes <https://www.rsb.org.uk/education/accreditation/institutions/Accreditation>

<sup>11</sup> <http://www.gatsby.org.uk/uploads/education/reports/pdf/gatsbyprofessionalregistrationleaflet.pdf>

<sup>12</sup> Royal Society of Biology Professional Registers <https://www.rsb.org.uk/careers-and-cpd/registers>

## Appendix A – STEM initiatives

Below are a number of initiatives which the Royal Society of Biology and its member organisations are undertaking which support the uptake of STEM and increasing STEM skills. They are extracted from the STEM Skills Gap response<sup>13</sup>.

31. The RSB careers committee have developed a range of resources<sup>14</sup> that demonstrate the variety of bioscience careers that students can enter, this material is available free for teachers to use with their students. Our most frequently visited pages of the website are our careers and placement support pages.
32. The teacher careers support project<sup>15</sup> facilitated through grant funding from the Biochemical Society, involves visiting new science teachers on PGCE courses to discuss careers provision and developing resources to integrate STEM careers into lessons. So far 65 university based initial teacher training providers have been contacted to provide their trainee science teachers with careers resources. To date 6 visits have taken place which has enabled us to directly engage with 389 science teachers, 9 further visits are scheduled to take place this academic year. As the scheme is in its first year, a full evaluation has not yet taken place.
33. The Biochemical Society is supporting the STEM Insight<sup>16</sup> programme which enables teachers to gain a wider experience of the STEM sector through placements in universities or in industry. The first bioscience placements took place in February 2016 and 16 bioscience placements have been funded so far, with a wide range of hosts including Syngenta, the Babraham Institute, University of Cambridge and University of Liverpool. The University of Glasgow is one of the new STEM Insight partners and the first placements in Scotland will be taking place in February 2017 at the University of Glasgow. The feedback received so far suggests the placements are already having a lasting impact:

*“We see the week as a big success since firm plans have been made involving: staff visits to talk at the College; a visit of Sixth Form students to the University of Liverpool, and a visit by a current undergraduate student to the College, sharing her university experience with the student body there”.* Dr Luciane Mello, University of Liverpool

*“I am looking forward to implementing my findings about careers, subject knowledge and techniques into my teaching and sharing with the other biology staff in my department and then more widely within Colchester.”*  
Teacher participant, Babraham Institute 2016

34. The Microbiology Society facilitate interactions between schools, colleges and universities through their Antibiotics Unearthed programme<sup>17</sup> where groups of students do real research, hoping to find the next new antibiotic. University partners will provide support for the school students and invite the students and relevant staff into their department to do further, more detailed analysis on any compounds isolated. The aim is that through engaging through real research, young people will be inspired to enter a career in science. This experience gives students the opportunity to familiarise themselves with a university or professional environment and engage with researchers.
35. The Science and Plants for Schools, in collaboration with the University of Cambridge, have produced resources to support students and teachers to increase awareness of the career options available within the

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<sup>13</sup>RSB response to Closing the STEM Skills Gap

<http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/science-and-technology-committee/closing-the-stem-skills-gap/written/45123.pdf>

<sup>14</sup> RSB Careers Resources <https://www.rsb.org.uk/careers-and-cpd/careers/career-resources>

<sup>15</sup> Biology Careers, Teachers Resources <https://www.rsb.org.uk/careers-and-cpd/careers/career-resources/resources-for-teachers>

<sup>16</sup> STEM Insight programme <https://www.stem.org.uk/stem-insight>

<sup>17</sup> Antibiotics unearthed <http://www.microbiologysociety.org/outreach/antibiotics-unearthed/>

plant sciences. The IntoBiology<sup>18,19</sup> website provides careers resources as well as support for students conducting extended investigative projects.

36. The Royal Society of Biology accredits bioscience courses across the UK, raising the standards of bioscience education across the sector. In December 2016, 213 degree programmes at 22 universities had achieved Advanced Accreditation through the RSB and 175 degree programmes at 25 universities had achieved Accreditation.
37. The Royal Society of Biology offers Chartered Biologist status and in addition under licence from the Science Council offers Registered Science Technician (RSciTech), Registered Scientist (RSci), Chartered Scientist (CSci) and Chartered Science Teacher (CSciTeach).

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<sup>18</sup> IntoBiology <http://intobiology.org.uk/>

<sup>19</sup> IntoBiology review <https://www.publicengagement.ac.uk/case-studies/intobiology-website>