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Dr Jim Fanning  
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Dear Dr Fanning,

### **The Development of a Digital Learning and Teaching Strategy for Scotland**

The Royal Society of Edinburgh (RSE), Scotland's National Academy, conducted a major inquiry into digital participation in Scotland, which reported in April 2014<sup>1</sup>. In its report the RSE recommended that the Scottish Government must take a national lead and coordinating role in ensuring that Scotland's young people, adults, businesses and organisations have the information and digital skills required for a thriving 21<sup>st</sup> Century digital society through formal education, workplace learning and lifelong and community learning. We therefore welcome the Scottish Government's commitment to develop a *Digital Learning and Teaching Strategy*.

A number of the findings and recommendations presented in our inquiry report are relevant to the themes being developed in the Scottish Government's consultation on the strategy. We would draw your attention particularly to:

- Section 4 on Education, skills and training which considers digital learning and skills in both the education system and for lifelong learning; and
- Sections 1.2 and 6.1 which comment on the digital inclusion agenda

We note the Scottish Government's desire to ensure alignment between the Digital Learning and Teaching Strategy and the National Improvement Framework for Scottish Education. Both the RSE and the Learned Societies Group on STEM Education in Scotland, of which the RSE is a member, have

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<sup>1</sup> Report of the Inquiry into spreading the benefits of digital participation in Scotland; RSE; April 2014;  
[https://www.royalsoced.org.uk/1136\\_FinalReport.html](https://www.royalsoced.org.uk/1136_FinalReport.html)

recently made submissions<sup>2</sup> to the draft National Improvement Framework. Both submissions reinforce the need for an implementation plan that clearly sets out how the strategic vision, purpose and priorities are to be delivered in practice. We are similarly of the view that an implementation plan needs to be developed in conjunction with the Digital Learning and Teaching Strategy. We would expect this to provide detail on the level of support that will be put in place, on the specific targets sought, on the allocation of responsibilities, and on how progress will be monitored and evaluated.

Since 2011 the RSE has also been coordinating a national project<sup>3,4</sup> which has sought to exemplify and support the provision of Computing Science in schools through the development of freely-available innovative teacher and learner materials.

### **Recognising the importance of developing digital skills**

Given the increasingly pervasive reliance on technologies and electronic services in both our personal and professional lives, the need for everyone to have basic digital skills is well recognised. However, figures suggest that 30% of the Scottish population (and 19% of the UK population) do not currently have such skills<sup>5</sup>. Further, the basic digital skills required are dynamic and will evolve over time. It is, therefore, difficult to predict the exact 'package' of digital skills that will be required by everyone in the long term. If the workforce is to be 'future-proofed', Scotland's education system must be designed to equip everyone with digital literacy skills and a mind-set that is flexible, creative and adaptive. This will be crucial to preparing today's young learners for a future economy in which the skills needed are not only unpredictable now, but will continue to change throughout their careers; a future in which individuals must have the ability and confidence to continue to learn and adapt long after leaving formal education.

While we recognise that the strategy is focused on school years education, it needs to make clear how connections will be made with broader developments aimed at improving levels of digital participation, including the Scottish Government's national framework for local action on digital participation<sup>6</sup>. Levels of digital exclusion are high among older people, people with disabilities and people facing multiple factors of deprivation, such as unemployment and low levels of education. There must, therefore, be specific provision to address the needs of adult learners who have never had the opportunity to develop information and digital literacy, or who would benefit from increasing and enhancing their skills. This is a key pre-requisite for digital inclusion. However, many, and particularly those in the hardest-to-reach groups, will need dedicated learning support.

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<sup>2</sup> RSE submission on the draft National Improvement Framework:

[https://www.royalsoced.org.uk/cms/files/advice-papers/2015/AP15\\_25.pdf](https://www.royalsoced.org.uk/cms/files/advice-papers/2015/AP15_25.pdf)

Learned Societies Group submission the draft National Improvement Framework:

[https://www.royalsoced.org.uk/cms/files/education/Learned%20Societies%20Science%20Education/LSG\\_NIF.pdf](https://www.royalsoced.org.uk/cms/files/education/Learned%20Societies%20Science%20Education/LSG_NIF.pdf)

<sup>3</sup> Computing Science Exemplification Project: [https://www.royalsoced.org.uk/1034\\_ComputingScience.html](https://www.royalsoced.org.uk/1034_ComputingScience.html)

<sup>4</sup> An article summarising the project has recently been published in Communications of the ACM: *Creating a New Generation of Computational Thinkers: Experiences with a successful school program in Scotland*; Communications of the ACM; Jeremy Scott & Alan Bundy; December 2015: [http://mags.acm.org/communications/december\\_2015?pg=39#pg39](http://mags.acm.org/communications/december_2015?pg=39#pg39)

<sup>5</sup> Ipsos MediaCT for BBC; Media Literacy: Understanding Digital Capabilities follow up September 2013 and March 2014; March 2014; [http://www.bbc.co.uk/learning/overview/assets/digital\\_capabilities\\_2014.pdf](http://www.bbc.co.uk/learning/overview/assets/digital_capabilities_2014.pdf)

<sup>6</sup> Digital Participation: national framework for local action; Scottish Government; April 2014  
<http://www.gov.scot/Publications/2014/04/6821>

## **Ensuring curriculum and assessment relevance in a digital context**

If Scotland is to realise its aspirations to be a ‘world-class digital nation’<sup>7</sup>, then it will require a public commitment from its education bodies and authorities to embed information and digital skills and computational thinking<sup>8</sup> across the curriculum and at all stages of education. The digital skills that people will need will vary greatly as their use of technology changes and as technology itself evolves. There is, therefore, no end point in the development of digital literacy; rather it is a journey of continuous learning.

The distinction between ICT skills and computing science is important. Some degree of understanding of ICT – that is, the application of existing technologies and systems – is now required in every domain. However, just as science education was recognised as an issue of strategic importance in the early 20<sup>th</sup> Century, so computational thinking and computing science must be embedded in the core curriculum of the 21<sup>st</sup>-Century digital society. This means that in the early stages of education some fundamental concepts of computing science should be introduced along with ICT, and practical experience of computing science technologies is required to bring the concepts of computing science to life. So teaching in the early stages naturally combines the two.

While the adoption of revised computing science qualifications in Scotland have significantly improved in their depth and rigour, computing science is not yet taught or perceived in schools on a par with other sciences (chemistry, physics, biology). There is, unfortunately, a void of understanding of computing science – as distinct from ICT – among policy makers, local authorities, head teachers, teachers, pupils and parents. This impacts on the number of pupils choosing computing science as a subject, on the number of qualified computing science teachers in schools (between 2008 and 2014 the number of publicly funded secondary teachers of computing declined by 17%<sup>9</sup>; with 12% of secondary schools reporting that they have no active computing science teacher<sup>10</sup>) and on the consistency of teaching. The RSE recommends that the specification of computing science qualifications is kept under periodic review; that in partnership work is undertaken to raise the profile of computing science within education, including with input from the Scottish Government, Education Scotland, school leaders, careers advisers, teachers, parents and learners; and that steps are taken to ensure that every secondary school has at least one qualified computing science teacher.

### **Professional Learning and Networking in Computing (PLAN C)**

A number of those involved in the RSE exemplification project have also led PLAN C, which was established in 2013 to provide professional learning opportunities to computing teachers in Scotland via the operation of local hubs. This has enabled computing teachers to discuss effective pedagogy for teaching computing concepts, particularly in the context of the revisions made to computing science in school with the introduction of the Curriculum for Excellence and the new qualifications.

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<sup>7</sup> The Scottish Government has a vision for Scotland to be a world-class digital nation by 2020

<http://www.gov.scot/Topics/Economy/digital/Digital-Dialogue2>

<sup>8</sup> I.e. understanding systems in terms of the ways they store, process and communicate information; top-down design; and designing, testing and implementing replicable solutions.

<sup>9</sup> Teacher Census, Supplementary data; Scottish Government; 2014

<http://www.gov.scot/Topics/Statistics/Browse/School-Education/teachcensusuppdata/teachcensus2014>

<sup>10</sup> Computing Science Teachers in Scotland; Computing at School Scotland; 2014

<http://www.cas.scot/wp-content/uploads/2014/11/CASScotlandReportComputingTeachersInScottishSchools.pdf>

To date, PLAN C has been funded by the Scottish Government (administered by the BCS, The Chartered Institute for IT and delivered by Computing At School Scotland), but we understand this funding commitment ended in September 2015. We therefore very much hope that continued funding can be secured to ensure the sustainability of the PLAN C hubs.

### **Improving access to digital technology for all learners**

A clear message to emerge from both the RSE inquiry report and its computing science exemplification project was widespread frustration with the restrictions placed on schools' network infrastructure, including on internet access and on content. Over-cautious filters limit teachers' use of digital technologies in the classroom, and their ability to support pupils to develop information skills fit for a digital world. Pupils are not taught to deal with risk in a safe but realistic environment, and cannot be properly supported to become responsible digital citizens. Further, restrictive ICT network policies can prevent teachers and pupils from making full use of contemporary and innovative teaching resources. It can also inhibit learners from using the internet in creative ways or from becoming content creators. With such social and creative skills being key foundations for a future workforce, local authorities must work with schools to make a realistic assessment of the risks and benefits of more flexible internet access, and set filters and restrictions accordingly. We therefore support the proposed priority for action identified in the strategy document for collaborative work involving local authority partners to develop standards and guidance around learner access to digital technology in schools. Indeed, we believe this work should be expedited as the need for a single Scotland-wide policy on web filtering in schools was identified by the ICT in Education Excellence Group which reported to the Scottish Government in January 2013<sup>11</sup>.

### **GLOW**

We also welcome the provision in the strategy for keeping the future arrangements for GLOW, the digital environment for supporting learning, under review to ensure that the tools and services remain relevant to meeting the requirements of the education system. In spring 2014, the Learned Societies Group carried out a brief enquiry<sup>12</sup> into how science teachers were responding to the Curriculum for Excellence and the qualifications' reforms, including their use of and, views on, GLOW. In terms of how useful the science teachers (based on 221 responses) found the support provided by GLOW for learning and teaching: 42% considered it to be of little or no benefit; 47% considered it to be of some benefit; with only 11% who considered it to be very beneficial. In reviewing GLOW provision, the Scottish Government should ensure that engages with the teaching profession.

While GLOW hosts a range of professional learning communities for teachers, we are conscious that in the sciences, online communities for Biology, Chemistry and Physics thrive outside of GLOW. This demonstrates that teacher communities are led by the profession and evolve dynamically, and this approach should be encouraged.

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<sup>11</sup> ICT Excellence in Education Group Report; January 2015

<http://www.gov.scot/Topics/Education/Schools/ICTinLearning/ICTinEducationExcellenceGroup>

<sup>12</sup> The Reforms in Scottish Schools' Science Education: Survey results; Learned Societies' Group; January 2015

[https://www.royalsoced.org.uk/cms/files/education/Learned%20Societies%20Science%20Education/Curriculum\\_Structure\\_Assessment\\_Survey\\_Report.pdf](https://www.royalsoced.org.uk/cms/files/education/Learned%20Societies%20Science%20Education/Curriculum_Structure_Assessment_Survey_Report.pdf)

**Extending the skills and confidence of teachers in the appropriate and effective use of digital technology**

The strategy document recognises the importance of ensuring that the teaching profession has the skills and confidence to use digital technology appropriately and effectively across the curriculum. The RSE's Digital Participation inquiry found that, in Scotland, there is huge variation in teachers' own digital skills which needs to be addressed. It is not included as a specific component of study for teachers in training. It is crucial that teachers are supported to up-skill in their understanding of how digital technologies are impacting industry in their subject areas; and how they use technologies for the delivery of learning. In its report the RSE recommended that information literacy, digital skills and computing science should be components of initial teacher education programmes for all primary and secondary teachers. Further, initial and refresher courses in information literacy and digital skills should be made available for current teachers. The introduction of the Standard for Career-Long Professional Learning by the General Teaching Council for Scotland (GTCS) and the implementation of Professional Update would certainly have the potential to support this recommendation.

We would be very happy to discuss these issues in more detail. Please do contact William Hardie at the Royal Society of Edinburgh if you would like to do so: [whardie@royalsoced.org.uk](mailto:whardie@royalsoced.org.uk), 0131 240 5031.

Yours sincerely,



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