



## **BCS Scottish Computing Education Committee Response to the Logan Report**

We very much welcome the Logan report and the emphasis it puts on the importance of Computing education, and are glad to see it reinforces many very important messages about the significance of the subject, the challenges it faces, and the best way it can be delivered. In this response, we highlight the suggestions that we believe are the most crucial for the health of computing education in Scotland, and add a couple of other suggestions which we feel are essential to achieve this vision.

### **Computing Science for all learners**

We agree that Computing Science should be formally taught from first year at secondary school in the same way that we do with other sciences. The Broad General Education Curriculum gives an entitlement to all learners to Computing Science and we would like to see that implemented in all schools and for more time than is currently offered to learners. In addition we feel primary and early years teachers should be supported to implement the computing curriculum throughout the Broad General Education phase. Easy to access teaching materials that require limited or no prior knowledge in Computing Science are crucial. These could build upon the guide for Primary and Early Years that was produced by Scottish academics and educators (teachcs.scot) that has been highly rated in independent research commissioned by the University of Edinburgh, as well as the success of the Barefoot Computing initiative, which has a wide range of resources mapped into the Curriculum for Excellence..

### **Need for more Computing Science teachers**

The need for more computing teachers has been something the community has been pushing for a long time and we're very glad to see this highlighted. Attracting people from industry into teaching is one route that can help here. Judy Robertson's report on solving the teaching crisis, commissioned by Skills Development Scotland, is very useful in understanding this problem more deeply and gives suggestions about actions to take to improve the situation, including the promotion of teaching as a career to undergraduates. The research demonstrates that some of the issues that were thought to be barriers to graduates moving into teaching training in CS, such as the supposition that graduates want higher wages than can be achieved in teaching, are less significant than had been believed, and that good promotion of the career could have significant effects.

### **PGDE routes into teaching**

It is currently a requirement that you need to have a CS degree or a degree with a significant element of CS. We believe this should remain, and would not consider a 16-week CodeClan training programme as a sufficient basis for being a computing teacher. Where short-term intensive courses could be useful would be in training qualified non-CS teachers to teach CS in the BGE phase, freeing up those qualified as CS teachers to focus on exam-level courses. There is a current initiative by BCS, Education Scotland and the University of the Highlands and Islands, with support from Microsoft, to create such a course a conversation course and, if successful, its widespread adoption through Scotland could have a significant impact on CS teacher numbers.

CodeClan courses could also have a role to play in professional learning for teachers. There may be some advantages to exposure to industry during teacher training, but it may be difficult to fit this into the training programme and may end up creating additional barriers to qualification. CodeClan may have a part to play in professional learning for existing Computing Science teachers, such as their Python course for teachers in recent years.

### **Curriculum changes**

The curriculum has been extensively improved over recent years. Whilst there are always improvements that could be made, we believe that recent improvements have moved the curriculum in the direction suggested, and believe further curriculum changes at the moment would be overwhelming for teachers, who have had to cope with frequent changes. However, there is a great deal of support from CS teachers for the existing curricular content at all levels to be reduced. We would welcome the SQA reducing the content of Computing courses, in particular keeping the 2020-21 arrangement for Higher and Advanced Higher with teachers able to choose either web design or database design instead of covering both topics.

### **Professional learning for teachers**

Although the majority of teachers' 35 hours of professional learning annually is taken up by school-wide sessions, teachers have shown their commitment and dedication to developing their skills in their own time where good quality opportunities focused on computing science are available. The PLAN C (Professional Learning and Networking in Computing) and the CodeClan Python courses were held at the end of the summer holidays and on Saturdays, with teachers committing to attending to improve their skills. The PLAN C model looked at the pedagogical content knowledge - how to teach computing, rather than just updating teachers' content knowledge. CodeClan would be a good model for updating content knowledge, but they are unlikely to have the background to support pedagogy. A set of 'virtual' PLAN C workshops throughout the year would also be of benefit to teachers.

The role of SSERC in providing CPD for teachers should be considered. SSERC have been supported by the Scottish Government and Education Scotland to build up their provision in computing and technology and they now have a Digital Education Manager who is focussing on primary and early years, and to some extent in BGE. This has been very successful, but there is currently no provision for supporting teachers at higher level. Government funding of SSERC to employ an additional staff member to focus on supporting computing teachers at exam level should be considered.

The University of Glasgow's Centre for Computing Science Education and the University of Edinburgh's Data Education in Schools project could also be well placed to offer professional learning opportunities, if funding was available.

### **Teaching Conference**

Computing At School (CAS) Scotland ran an annual conference for several years. This was highly successful and involved primary, secondary, college and university educators as well as industry speakers. The conferences focussed on the presentation of innovative teaching methodologies, CS-related academic research and an opportunity to attend seminars on a wide variety of CS-related educational topics.

This annual event was highly successful, but could not continue due to lack of resources. Its reinstatement would be most welcome by educators across Scotland. Financial support for CAS Scotland would also be welcomed as this organisation could support collaboration, communication and ongoing professional learning. CAS Scotland and its annual conference ran for many years organised and run by teachers volunteering their time.

### **Informative material for parents and guardians**

Informative material, made available through schools to parents and guardians would help to ensure that parents and guardians understand the difference between consuming technology (which they often feel their students do too much) and creating technology. Many CS departments are required to do this already for course choice booklets but professionally produced national resources would be a great addition.

### **School-stage extra-curricular programming clubs should be strategically supported.**

It needs to be recognised that providing support for all demographics (including disadvantaged, rural and remote areas) requires more resources. It is essential that applications for funding are not judged on a cost-per-head basis, but that there is a willingness to provide larger funding for initiatives that can evidence their ability to reach into hard-to-reach areas and provide long-term influence, even where this is more

expensive. A long-term model of funding for successful enterprises is also important - it is difficult to develop sustainable initiatives when funding is very short term, and much momentum and expertise is lost.

### **Overcoming gender-stereotyping in early years.**

We agree that this is a huge issue. There are some excellent initiatives trying to address this, including some initiatives in individual schools. Some of these are outlined in the RSE Tapping all out Talents report, and could be the basis of broader initiatives. There is a lack of research into why the gender gap in computing is continuing to get worse at school level when this is not the case in other STEM subjects; funding should be made available to carry out such research.

## **Topics not addressed in the report**

### **Cost of Computing labs in schools**

Schools should be encouraged to see computing as a fundamental part of the education they provide, and given appropriate funds to allow this. Computing requires a dedicated computing suite, which is expensive to install and maintain, and needs to be updated from time to time. For a school that is trying to make budget cuts, cutting computing is a financially appealing prospect. Funds need to be available to make sure schools are not incentivised to cut computing from their curriculum. It also needs to be recognised that where schools do drop computing education, the cost of getting computing education back into those schools is correspondingly high, so support should be given to schools in danger of losing their computing provision to ensure this retrograde step is not taken.

### **Equity of provision across the country**

Currently, access to computing education is very varied. There is evidence that the likelihood of access to good computing education is demographically affected, with students in disadvantaged, rural and remote areas less likely to receive it. This is another area in which research is required to understand the problem more fully.

### **Teaching materials and resources**

Whilst the ethos of the CfE is towards autonomy for teachers, in practice this can make the implementation of the CS curriculum challenging for teachers that are not used to it, particularly in situations where non-CS teachers are having to teach CS. The development of exemplar materials that can be used as the basis for lessons where necessary could be very useful. The Teach CS Guide for Secondary Schools will be ready soon and should be widely promoted and funded, but there may be scope for additional materials here. The Primary and Early Years edition was distributed to all Primary schools with funding from SDS and RSE. With additional funding, the Secondary version could also be printed and sent to all Scottish Secondary schools. England's investment in the National Centre for Computing Education presents Scotland with an opportunity to reuse and repurpose OGL resources and training including extensive online training courses for CS subject knowledge for teachers at all phases of school, and over 500 hours of lesson content including lesson plans, assessment and homework activities – all available online and without charge to teachers in Scotland. These materials could be mapped to the CfE and reused.

### **Research into the situation of CS in schools**

The data shows that uptake of computing at all exam levels continues to decline, despite considerable efforts to halt this decline. What is lacking is research into why this is happening, where in particular this is happening (for example, is this happening within schools that have good computing provision, or is it only an effect of more schools dropping computing?), and whether there are demographic inequalities in this decline. We believe research into the cause of the decline is urgent in order to be able to effectively address it.

In summary, we believe that advancing the recommendations for computing education put forward by the Logan report in the ways discussed above would have a profound effect on the levels of computing education across Scotland, which in turn would provide the basis for the economic and social benefits to the country that the report discusses. This is a long-term project and we would not expect to see the full benefits, such as those supported by the improvements in education in primary schools, for many years. Nevertheless, there are many actions that could significantly improve the situation in the short term as we build towards our long-term aim of a population that is highly literate and skilled in computing. Many of the above suggestions

require government funding to be effective, and we appreciate that finding such funding can be challenging. However, a relatively small amount of funding directed appropriately could make a significant difference to computing education in Scotland.

**Summary of suggested initiatives:**

- A more explicit requirement for schools to teach computing and computational thinking throughout BGE, as required by the Curriculum for Excellence
- Development of resources to support computing teaching at BGE, for example built on the teachcs.scot and Barefoot materials
- Incentivation and funding for schools to maintain and update their computing suites so that they can continue to teach the subject
- Promotion of teaching as a career in universities
- Funding to support for CPD for teachers, for example through summer schools and virtual training, and through a dedicated SSERC role
- Funding to support CAS Scotland and their teaching conference
- Funding to develop professional materials to promote computing to parents and guardians
- Funding for research into the factors behind the gender balance failing to improve and the uptake of CS in schools continuing to decrease.
- Provision of funding for outreach activities from experienced and tested providers that is long term and allows for extra costs to focus on schools in deprived, rural and remote areas, and on attracting girls and BAME students.
- Reuse/repurpose the NCE resources and training materials

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