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Moray House School of Education

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Digital Education

Moray House School of Education Election Briefings

Education from early years to 18
Research and Practice Contributing to Policy

29 March 2016

Digital Education

Many nations have responded to rapid technological change by reshaping school education to develop learners' capacities for working with data and computation. In spite of our rich history of technological innovation, the Scottish curriculum now lags behind. The Centre for Research in Digital Education is well positioned to continue work with policy makers and practitioners to design a curriculum appropriate to a world increasingly dependent on data and computation.

Key points for consideration

- Computational thinking (including programming) must be a core entitlement of Scottish school learning, beginning at primary school.
- Our curriculum should equip learners to understand the positive and negative effects of technology on society and individuals.
- School learning outcomes need to reflect that developing critical and practical skills in working with digital data is a core responsibility.
- Technology itself will not improve learning. Teachers and schools urgently need help to develop deeper knowledge of creative pedagogical approaches to technology which connect with students' digital practices beyond the school environment.
- All schools should have access to the equipment and infrastructures needed to teach a curriculum which takes data and computation seriously.

Briefing

In a world increasingly driven by data and computation, the ability to *use* digital technology and software packages is insufficient: education for the digital age needs to be broadened to encompass a deeper understanding of how to work with computation and data, and how to understand its societal effects. Children need our help in understanding how the technology that shapes the world around them works, how it impacts on society, and how they can actively shape a data and computation-driven world. To do this, they need a deep conceptual understanding of the information and processes underlying software and digital data, and a broad understanding of its social and cultural consequences.

Building a critical understanding of technology in everyday life

Software and digital technology have rapidly become embedded in children's daily lives. 96% of 8-11 year olds in the UK now have internet access at home, compared to 61% in 2005. The proportion of UK 5-15 year olds with access to a tablet computer at home increased from 71% to 81% between 2014 and 2015 (Ofcom, 2015). However, as an ongoing study in the Centre for Research in Digital Education confirms, primary school children often have little idea of how a computer or the internet works. Basic understanding of how software and hardware operate is not currently part of the curriculum. This is problematic because such basic knowledge is the foundation for informed, critical reasoning about the potential benefits and limitations of emerging technologies and the extent to which they impact society.

The importance of computational thinking

Digital education in Scotland should be informed by the excitement, ambition and innovation of computer science as an intellectual endeavour (see Furber, 2012: 6). In the last decade, there has been an international shift towards improving computer science education: countries including the US, Israel, New Zealand, Germany, India and South Korea have reformed their curricula to emphasise computer science as an intellectual discipline. The study of computational thinking from early primary school is now mandatory in England[i]. Computational thinking includes understanding process and information using abstractions and pattern generalisations, symbol systems and representations, and algorithmic notions of flow of control. Although it is a valuable skill, programming (also referred to as coding) is only one aspect of computational thinking.

Scotland has been relatively slow to respond to the need for improved digital and computer science education. While a recent review of the Technologies curriculum has been undertaken by Education Scotland,[ii] and the Scottish Government is in the process of developing a strategy for digital learning[iii], we believe that neither the review nor the consultation on strategy are sufficiently ambitious. The current Experiences and Outcomes for Technologies are dated, confusing and insubstantial – in the Moray House School of Education we are helping to redevelop aspects of these to reflect a principled approach to computational thinking. We argue that changes should reach further than a small portion of the Technologies curriculum. The wider curriculum should reflect that (a) digital education is a responsibility of all teachers, who will need appropriate support to fulfill that responsibility and (b) computational thinking and an understanding of the social effects of technology are core elements of digital education.

Support for teachers

Technology by itself will not improve learning: it is the teachers' skill and imagination in creative pedagogical uses of technology which will make the difference (OECD 2015). Schools need to recognise the widespread use of and access to digital technology outside of school and connect digital education to students' digital practices beyond the school environment. This will involve partnership with parents and require negotiation about technical and ethical challenges in helping young people to understand their rights and associated risks as users of technology.

Teachers will require considerable support to integrate the proposed curricular changes within their practice: initial teacher education and continued professional learning provision should be updated accordingly. More specialist computing teachers will be required in secondary schools to build on improvements in computational thinking at primary school. As acknowledged in the Scottish Government's analysis of feedback on the new digital learning strategy, attention should be given to equity of access to technology in schools across Scotland.

Conclusions

Computational thinking, programming, data-handling skills, and the capacity to understand the societal effects of these must be a core entitlement of school learning, beginning at primary school.

[i] https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study
[ii] http://www.educationscotland.gov.uk/Images/TechnologiesImpactReport__tcm4-850866.pdf
[iii] http://www.gov.scot/Publications/2016/03/9409

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March 2016. All information correct at the time of going to print.