

The Royal Society: *Shut down or  
restart? The way forward for  
computing in UK schools*

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This report analyses the current state of Computing education in schools and sets out a way forward for improving on the present situation. With support from the Royal Academy of Engineering and others the Royal Society has used its 'convening' role to bring together a wide range of distinguished Computer Scientists and stakeholders to explore problems and propose solutions.

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[http://royalsociety.org/uploadedFiles/Royal\\_Society\\_Content/education/policy/computing-in-schools/2012-01-12-Computing-in-Schools.pdf](http://royalsociety.org/uploadedFiles/Royal_Society_Content/education/policy/computing-in-schools/2012-01-12-Computing-in-Schools.pdf)

# Main findings – 1 (status)

The current delivery of Computing education in many UK schools is **highly unsatisfactory**. Although **existing curricula** for Information and Communication Technology (ICT) **are broad and allow scope for teachers to inspire pupils** and help them develop interests in Computing, many pupils are not inspired by what they are taught and gain nothing beyond basic digital literacy skills such as how to use a word-processor or a database.

# Main findings – 1 (status)

This is mainly because:

- 1. The current national curriculum in ICT can be very broadly interpreted and may be reduced to the lowest level where non specialist teachers have to deliver it;**
- 2. there is a shortage of teachers who are able to teach beyond basic digital literacy;**
- 3. there is a lack of continuing professional development for teachers of Computing;**
4. features of school infrastructure inhibit effective teaching of Computing.

# Main findings – 2 (understanding)

There is a need to **improve understanding** in schools of the **nature and scope of Computing**. In particular there needs to be recognition that Computer Science is a rigorous academic discipline of great importance to the future careers of many pupils. The status of Computing in schools needs to be recognised and raised by government and senior management in schools.

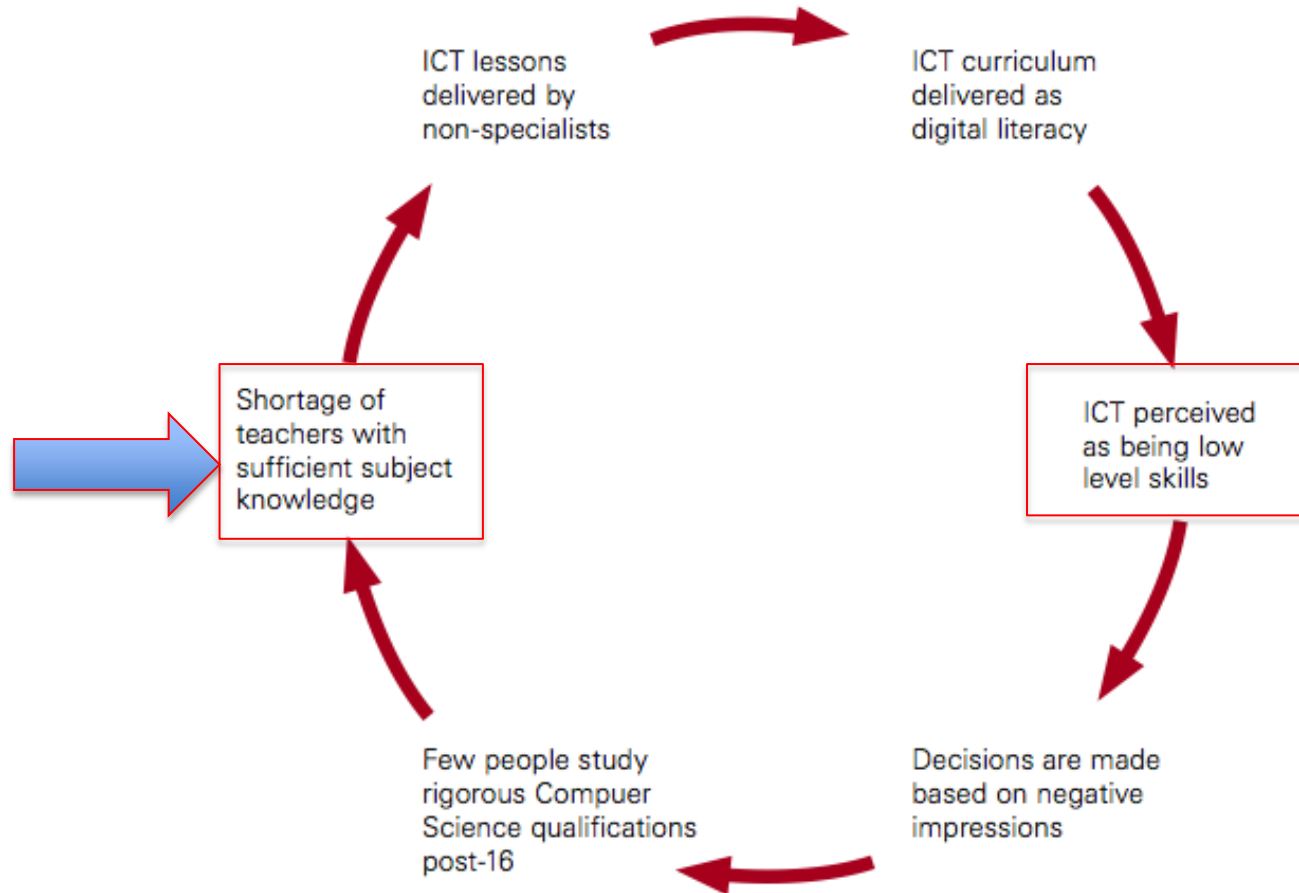
# Main findings – 3 (right of child)

Every child should have the **opportunity to learn Computing at school, including exposure to Computer Science as a rigorous academic discipline.**

# Main findings – 4, 5 and 6

4. There is a need for qualifications in aspects of Computing that are accessible at school level but are not currently taught. There is also a need for existing inappropriate assessment methods to be updated.
5. There is a need for augmentation and coordination of current Enhancement and Enrichment activities to support the study of Computing.
6. Uptake of Computing A-level is hindered by lack of demand from higher education institutions.

# Main findings





# Recommendations: 1 (redefine name)

The **term ICT as a brand should be reviewed** and the possibility considered of disaggregating this into clearly defined areas such as digital literacy, Information Technology and Computer Science. There is an analogy here with how English is structured at school, with reading and writing (basic literacy), English Language (how the language works) and English Literature (how it is used).

The term 'ICT' should no longer be used as it has attracted too many negative connotations.

# Recommendations: 2 (teachers)

The **government should set targets for the number of Computer Science and Information Technology specialist teachers**, and monitor recruitment against these targets in order to allow all schools to deliver a rigorous curriculum. This should include providing training bursaries to attract suitably qualified graduates into teaching – for which industry funding could be sought.

Education Scotland should ensure that the declared entitlement of all learners to third-level outcomes in Computing Science is implemented in all schools for all learners using appropriately qualified teachers.

# Recommendations: 3 (additional funding)

Government departments with responsibility for Education in the UK should **seek industry support to extend existing funding** in this area, and should ensure that there is coordination of CPD provision for Computer Science and Information Technology teachers that deepens subject knowledge and subject-specific pedagogy.

Government should set a minimum level of provision for subject-specific CPD for Computing teachers, should seek support from business and industry to make that provision, and should ensure that the provision is well coordinated and deepens subject knowledge and subject specific pedagogy.

# Recommendations: 4 (infrastructure)

School infrastructure service providers, working with others, should prepare a set of off-the-shelf strategies for balancing network security against the need to enable good teaching and learning in Computer Science and Information Technology, and should encourage schools to discuss and adopt them with their service providers. Such a “Guide to Best Practice” should be used by schools and local authorities as part of any tendering process for outsourced service provision.

# Recommendations: 5 (educational tools)

Suitable technical resources should be available in all schools to support the teaching of Computer Science and Information technology. These could include **pupil-friendly programming environments** such as Scratch, **educational microcontroller kits** such as PICAXE and Arduino, and **robot kits** such as Lego Mindstorms.

# Recommendations: 6 (curriculum)

The Department for Education should remedy the current situation, where good schools are dis-incentivised from teaching Computer Science, by **reforming and rebranding the current ICT curriculum** in England. **Schemes of work should be established for ages 5 – 14** across the range of Computing aspects, e.g. digital literacy (the analogue to being able to read and write), Information Technology, and Computer Science.

These should be constructed to be implementable in a variety of ways, including a **cross-curricular approach for digital literacy** at primary and early secondary school. Schools may prefer not to impose a timetable or separately staff these elements at this age, but the existence of separately-defined learning experiences will ensure that each strand is always properly developed – unlike at present.

# Recommendations: 6 (curriculum)

A **timetable distinction** should then be in place **from the age of 14**, allowing pupils to make a well-informed choice to study for recognised qualifications in Information Technology and/or Computer Science.

# Recommendations: 6 (teachers)

Given the lack of specialist teachers, we recommend that only the teaching of digital literacy is made statutory at this point.

However, the long-term aim should be to move to a situation where there are **sufficient specialist teachers** to enable **all young people to study Information Technology and Computer Science at school**. Accordingly, the Government should put in place an action plan to achieve this.

The schools inspectorates should monitor the implementation of this change to ensure that the problems of the current curriculum are not replicated.



# Recommendations: 7 (teachers)

In order to redress the imbalance between academic and vocational qualifications in this area – and to ensure that all qualifications are of value to those who take them – the departments for education across the UK should encourage Awarding Organisations to **review** their **current provision** and develop Key Stage 4 (KS4) qualifications in Computer Science in consultation with the UK Forum (see recommendation 11), universities and employers.

Awarding Organisations across the UK should review and revise the titles and content of all new and existing qualifications in this area to match the disaggregation described above (e.g. Computer Science, Information Technology and digital literacy).

# Recommendations: 8 (policymaking)

The **UK Forum** (see recommendation 11) **should advise Awarding Organisations** on appropriate assessment methods for qualifications in digital literacy, Information Technology and Computer Science.

# Recommendations: 9 (policymaking)

The UK Forum (see recommendation 11) should put in place a **framework to support non-formal learning in Computer Science** and **to support teachers**. Considerations include after-school clubs, school speakers and mentoring for teachers in developing their subject knowledge. Bodies such as STEMNET will have a role to play in implementing this.

To inform the focus of investment in non-formal learning in Computing, the UK Forum should also look at establishing a rigorous evidence base for the effectiveness and value of various Computer Science E&E activities. Affordability will also be a relevant consideration.

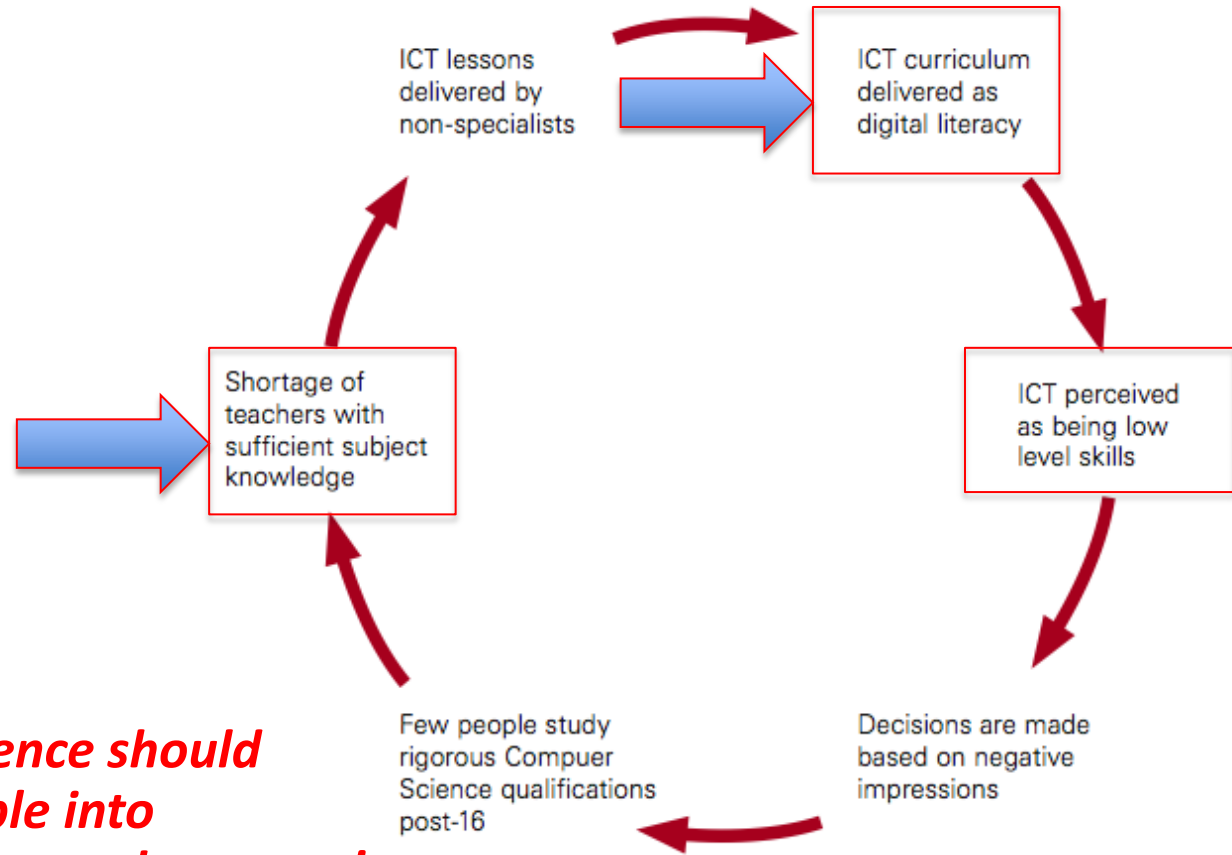
# Recommendations: 10 (policymaking)

**Awarding Organisations should consult with the UK Forum** (see recommendation 11 in Chapter 2) **and HE departments to develop rigorous Level 3 academic qualifications in Computer Science.**

# Recommendations: 11 (policymaking)

The Computing community should **establish a lasting UK Forum** for joint working and coordination between the many Computing bodies, in order to progress the recommendations within this report. The Forum should provide regular progress reports on the implementation of the recommendations.

# Conclusion



***Learning Computer Science should develop young people into ‘technology designers and creators’ rather than merely ‘technology users’ – a philosophy of creativity and expression rather than mere productivity.***

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