

ICT and Computer Science in UK schools

Naace, ITTE, and the Computing at School Working Group, June 2012



COMPUTING AT SCHOOL
EDUCATE · ENGAGE · ENCOURAGE
In collaboration with BCS, The Chartered Institute for IT



Naace is a professional membership association of educators, technologists, policy makers, school leaders and teachers who represent the role of technology in advancing education. Naace is recognised as the Information and Communication Technology (ICT) subject association for teachers and schools.

Computing at School (CAS) is a grassroots organisation for Computer Science teachers in UK schools. Membership includes teachers, parents, governors, exam boards, industry, professional societies, and universities. CAS is a collaborative partner with the BCS through the BCS Academy of Computing. CAS is recognised as the subject association for Computer Science.

The Association for IT in Teacher Education (ITTE) is the professional association for IT teacher training across the UK. Its members are involved in initial teacher training of primary teachers, subject specialist ICT and computer science teachers in secondary and post-16, Technology Enhanced Learning (TEL) across all subjects and research into ICT/computer science/TEL pedagogy.

Naace, CAS and ITTE have complementary roles, and are committed to working together to reform and develop the curriculum and pedagogy in Computer Science and ICT in British schools. The three organisations will work together to prepare future teachers effectively and to support existing teachers with good CPD.

Curriculum

We see ICT and Computer Science as forming part of a broad and balanced curriculum, which every young person should have the opportunity to learn from early years and primary school onwards. We believe that schools should have the freedom to organise this curriculum to best meet the needs of their learners and context.

- **Computer Science** is the study of the foundational principles and practices of computation and computational thinking, and their application in the design and development of computer systems. It is a subject discipline, on a par with Maths or Physics. A [model curriculum for Computer Science](#)¹ has been developed by CAS.
- **Information and Communication Technology (ICT)** focuses on the creative and productive use and application of technology and computer systems, especially in organisations. We take ICT to also include Information Technology, Applied ICT, Digital Literacy and Skills, and e-safety, across the curriculum. Naace has developed a [Curriculum framework for ICT for Early Years/KS1/KS2 and KS3](#)², and is further developing this in consultation with its members.

¹ <http://www.computingatschool.org.uk/index.php?id=cacfs>

² <http://www.naace.co.uk/ks3ictcurriculum>

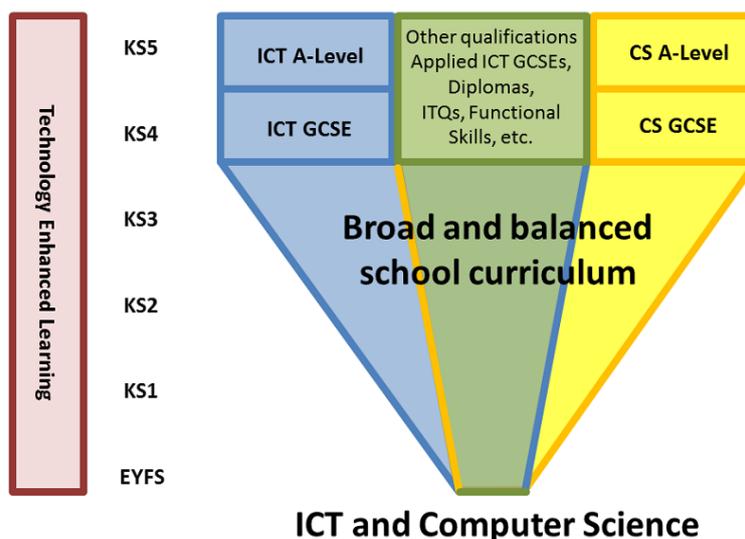
The two overlap, of course, especially in the early and primary years: an education in Computer Science includes aspects of the use and application of computers, and an education in ICT covers aspects of programming and understanding of computing devices. But as learners progress to specialised subjects, differing characteristics emerge which define ICT and Computer Science as separate subjects with their own qualifications:

Information and Communication Technology	Computer Science
The study of computer systems and how they are used	The study of how computer systems are built and work
Human need is central to the subject	Computation is central to the subject
Concerned with the design, development and evaluation of systems, with particular emphasis on the data, functional and usability requirements of end users	Concerned with algorithmic thinking, and the ways in which a real-world problem can be decomposed in order to construct a working solution
Focuses on building or programming a solution by using a combination of currently available devices and software.	Solves problems and develops new systems by writing new software and developing innovative computational approaches.
Emphasis on selecting, evaluating, designing and configuring appropriate software and devices. Programming is one method of creating desired outcomes.	Emphasis on principles and techniques for building new software and designing new hardware. Programming and coding is a central technique to create outcomes.
ICT supports, enhances and empowers human activity and informs future developments.	Computation is a “lens” through which we can understand the natural world, and the nature of thought itself, in a new way.
Tending towards the higher level study and application of ICT in a range of contexts, from academic to vocational.	Tending towards higher level academic study of Computing and Computer Science.

We believe that every student should have an entitlement to Computer Science and ICT as part of the curriculum from early years and primary school onwards and should have the opportunity to specialise within the subject at secondary level. For Computer Science this represents a major change from the status quo.

ICT is an established National Curriculum subject with many schools already interpreting and teaching ICT in creative and interesting ways as a discrete subject within a broad and balanced curriculum. Where a school’s curriculum already includes clearly-visible aspects of Computer Science then this should be encouraged and good practice shared. Where aspects of Computer Science are not clearly visible then schools should review their curriculum accordingly.

This does not imply that Computer Science should be *taught* separately in the early key stages or form part of a separate scheme of work. This picture gives the idea:



- **Early Years and Primary school.** The curriculum should contain aspects of ICT and Computer Science, although these will not be taught in discrete lessons any more than Chemistry and Physics are within Science. Although the students may be unaware of the distinction between different strands of the curriculum, it is important for the *teacher* to be aware of their separate learning objectives, just as he or she is aware of the learning objectives for “Life processes and living things” and “Physical processes” when teaching topics containing science.
- **Key Stage 3.** Both Computer Science and ICT should still be part of a broad and balanced curriculum and taught discretely where appropriate. Schools may well differ in the extent to which Computer Science forms a separate subject at the start of KS3 but clear distinctions should be made within the Key Stage 3 curriculum to allow pupils to make informed choices for KS4.
- **Key Stage 4.** At KS4 ICT and Computer Science subjects become quite distinct (similar to Physics and Chemistry as Sciences), and lead to separate GCSEs and other qualifications. Students are free to choose to study both disciplines, or one, or neither.
- **Post 16.** Schools and colleges will continue to offer a range of related studies and qualifications to meet the needs of all students. There will be distinct A-levels in a range of rigorous and academic specialised subjects for Computer Science and ICT. Computer Science A-Level should be recognised as a rigorous, academic discipline to prepare students for Computing related Higher Education or careers within the industry.
- **Project based learning, cross-curricular themes, competitions, and out of school clubs,** have a significant role to play in engaging learners in gaining experience, knowledge and understanding of ICT and Computer Science.

Statutory ICT

Statutory ICT is the statutory National Curriculum subject, in England, that will continue until at least 2014. Its content and nature are under review, along with the rest of the National Curriculum.

Until September 2014, the statutory subject covers both ICT and Computer Science.

Qualifications

At Key Stage 4 we believe that there should be a broad range of qualifications, including

- Unashamedly academic GCSEs in Computer Science
- Rigorous GCSEs in ICT
- Applied ICT qualifications such as Creative Multimedia
- Vocationally-oriented technical qualifications such as Systems Administration or Web Development, with considerable Computer Science content
- ICT functional skills qualifications

GCSEs in Computer Science should be available to all pupils, and this discipline should be recognised alongside other “science” based subjects within the English Baccalaureate.

With new rules on GCSE equivalence for school performance tables (Sept 2012), ICT qualifications have already improved to provide the required rigour to meet government standards. Naace is committed to taking a lead in reviewing the ICT GCSEs and other ICT qualifications.

Technology enhanced learning

At all Key Stages, information and communication technology should be used to enhance teaching and learning right across the curriculum: we call this “Technology enhanced learning” (TEL). When there is a clear focus on learning rather than technology, systems such as interactive whiteboards, virtual learning environments, video conferencing, blogs, wikis, podcasts, video, and mobile devices can have a transformative impact on both learning and teaching. Pupils' use of such technology both draws on and enhances their digital skills.

The purpose of using technology in this way should be to improve learning in that subject, *and not a back-door way to teach ICT, still less Computer Science*. Technology Enhanced Learning is not part of the curriculum as a subject in its own right. There can be no laid-down programme of study, no attainment targets, no assessment. The technology *serves* learning; it is not the *object* of learning. It follows that:

- The use of technology in other subjects (English, say, or Geography) should be assessed by Ofsted as part of the school’s teaching and learning in that subject, not as part of its delivery of the National Curriculum subject ICT.
- The extent and nature of the use of technology in other subjects should be driven exclusively by the needs of those subjects, and not by the needs of the ICT or Computer Science curricula. Nevertheless, it would be extraordinary for any subject to make no use of technology - which is recognised in the statutory requirements for these subjects within the National Curriculum in England.
- The impact of technology on the achievements of learners should be understood, monitored and evaluated. For example by schools using self-review frameworks or considering the successful practice disseminated by schools such as “3rd Millennium Learning” award winning schools.