

Computing in key stage 4

Determining the way forward



In March 2017, the CAS Board and working group recognised that there was a number of concerned voices and alarming trends appearing within the teaching and assessment of Computing at key stage 4.

The CAS Board has asked the CAS Assessment working group to write a policy paper about key stage 4 assessment for computing, consulting with CAS members, awarding organisations, and other stakeholders.

A number of face-to-face meetings, online discussions and online surveys took place involving teachers, awarding organisations, trainers and industry representatives. These were designed to gain facts and opinions from CAS members. Opinions expressed on the CAS community forum were also taken into account.

With the intention of ensuring more pupils follow a qualification in Computing and that all pupils have an experience of Computing principles in key stage 4 there are three clear issues emerging from the **CAS Assessment working group** discussions and surveys. There is a need for:

- 1 A GCSE in Computing
- 2 Vocational qualifications in the broader computing area
- 3 Provision for all pupils to gain computing experience and certification

In addition to these 3 key areas of GCSE Computing, vocational computing and Computing for All and CPD a number of points were raised, discussed and agreed as having an impact upon the provision of Computing at key stage 4 including: bring clarity of the computing curriculum, supporting and then reviewing the current GCSE Computer Science, drawing attention to the need for professional development and subject knowledge enhancement of computing teachers and making industry standard software more easily available.

These are discussed under

- 4 Further findings

and finally, *“There is no them, only us”* a call to action by CAS members.

1 A GCSE in Computing

Although the figures for pupils studying for GCSE computer science are positive, those pupils represent a small proportion of each annual cohort. There are many pupils who do not receive a computing education at key stage 4, because of schools' capacity to provide computer science courses and the dearth of alternative courses that schools can offer. Unless more provision is made, it seems likely that fewer pupils will be taking a computing qualification in 2020 than were in 2010, which is precisely the opposite outcome than everyone is seeking. We need to start this activity now because the process of introducing new qualifications necessarily requires consideration and consultation.

CAS proposes that an additional GCSE is created that more fully reflects the computing curriculum including digital literacy and information technology, and which includes the principles of Computing. This GCSE must be as academically challenging as the computer science GCSE but develop a broader knowledge and understanding of the application of digital technologies. It is important for pupils going on to further and higher education that they have a relevant GCSE opportunity. The needs of these pupils are not served by the provision of vocational awards.

There is pupil interest and teaching capacity to sustain study of such a focussed GCSE. This GCSE need not be a competitor to computer science but an alternative to attract other pupils into studying Computing in key stage 4. There are clear arguments supporting the notion that any overlap between computer science and a computing GCSE relates only to the essential elements of working in this field, that is, computational thinking as the overarching approach, and making problems computable, that is, through programming in computer science and IT solutions in computing. A decision whether disallowed combinations would apply can be made when the subject criteria and content is established - the important issue is addressing the need to have a different GCSE. There is urgency; work needs to start now for teaching to begin in September 2019.

Recommendation: with immediate effect, CAS members work with awarding organisations, Ofqual, and the DfE to establish a subject criteria for computing and then a GCSE Computing.

2 Vocational qualifications in the broader Computing area

The content of computing and the pervasive nature of technology in all areas of work justify the provision of a good range of vocational courses. The recent widespread removal of less rigorous qualifications before alternatives were in place means there are too few vocational courses available to give choice to schools so they can meet the needs of their pupils.

It is absolutely essential that the DfE understands that the accreditation of these qualifications are carried out in a timely manner to ensure schools can better prepare and pupils are given adequate opportunity to consider their options. (In July 2017, schools still do not know what courses they might be able to offer for teaching from September 2017 for examination in 2019; this is not reasonable in the future.)

CAS promotes and supports **vocational courses** in Computing, meeting the Progress 8 criteria, including support for the Tech Awards currently under consideration by the DfE.

It is clear from the DfE that the inclusion of qualifications on the approved list is dependent upon awarding organisations submitting qualifications for consideration. All those submitted must meet the Department's published quality standards to be included on the list. The low number of IT qualifications in the Technical Award category on the lists is, in part, due to fewer having been submitted for consideration.

Recommendation: CAS members work with awarding organisations, Ofqual, and the DfE to establish a wider range vocational qualifications.

3 Provision for all pupils to gain Computing experience and certification

The National Curriculum makes it explicit that ALL pupils should continue with computing in key stage 4. Teachers report that many pupils do not have the opportunity to continue. No one monitors or enforces the key stage 4 provisions of the POS for computing. In practice it is widely ignored. Many pupils in key stage 4 are not taught to:

- develop their capability, creativity and knowledge in computer science, digital media and information technology
- develop and apply their analytic, problem-solving, design, and computational thinking skills
- understand how changes in technology affect safety, including new ways to protect their online privacy and identity, and how to identify and report a range of concerns.

CAS proposes that resources are made available to schools that enable pupils to experience these aspects of the broader curriculum. The *CAS Future Citizen/Computing for All* project will exemplify ways of providing the opportunities, resources for teaching and learning and a means of certification. It will encourage pupils to become future citizens – able to use, and express themselves and develop their ideas through, information technology, and computational thinking and to have a better understanding of computer science and digital literacy at a level suitable for the future workplace and as active participants in a digital world.

CAS Future Citizen is valuable to the pupil and their future. The certification raises the status of the activity. The method of assessment should be a valuable learning experience, ensure the validity of the award but ensure the efficacy of the process. This provision is designed for pupils who do NOT want to do a key stage 4 Progress 8 qualification – the non-specialists.

The developing ideas are available through <https://goo.gl/4fJOuP>

Recommendation: CAS members work with curriculum designers and developers to create a resource that curriculum planners in schools can accommodate in the key stage 4 timetable.

4 Further findings

In addition to the 3 key areas of GCSE Computing, vocational computing and Computing for All and CPD the following points were raised, discussed and agreed as having an impact upon the provision of Computing at key stage 4. Computing At School will undertake to:

- 1 **provide clarity** about what the subject computing is and the nature of computer science, information technology and digital literacy.
- 2 facilitate long-term **support and then review** of the GCSE for Computer Science and the associated NEA.
- 3 ensure the importance of **teacher training and CPD** is acknowledged and supported by key stakeholders.
- 4 pursue the **availability** of less costly industry standard software.

Clarifying the subject area of Computing

The definitions provided by the Royal Society (2012) continue to provide a way of communicating the range of the curriculum. The descriptions of computer science, information technology and digital literacy remain valid but more exemplification is necessary. The document, “The new computing curriculum, terminology and definitions” could be the basis for further communication but it requires revision to be more aligned to more widely accepted definitions and inclusion of the foundations, applications, implications construct. The survey suggests (2.20) that there is a desire of a significant minority of respondents to return to the content of the ICT qualifications. Perhaps this indicates that the clarity of communication is not good and that we need a better understanding that computing encompasses the skills development of using applications (digital literacy) and the application of those skills through problem solving and projects (information technology) that were a feature of the GCSE ICT qualifications.

Support and review of GCSE Computer Science

An early conclusion was that any review of the current GCSE for Computer Science is not valid until at least one full cycle of teaching and assessment has taken place. Concerns regarding Controlled Assessments (CA) might be applicable to the Non-Examination Assessments (NEA). The statistical review by awarding organisations and visits under Joint Council for Qualifications regulation should provide important indication of the efficacy and value of the NEA. There are mixed opinions regarding NEA with some advocating them because they provide the teacher with input into the assessment process and they provide a different assessment method. Workload and negative impact on teaching were cited as the main reasons for rejecting the use of NEA. The science approach of approved practicals was seen by some as being a positive way forward.

Teacher training and CPD in the area of computer science

It is widely recognised that a key factor impacting upon schools' capacity to offer Computing qualifications is the availability of experienced, qualified and confident staff. The value of current activities is recognised; those provided through the Network of Excellence, CAS Regional Centres, volunteer members, awarding organisations and commercial enterprises provide a variety of training opportunities. However, less than half of the survey respondents indicated that they have appropriate CPD, either related to the subject content or the examination process.

Learning how to computer program is difficult and requires a great deal of support. Many teachers need to learn to computer program before they learn *how to teach computer programming*. There are some established methods of training but our understanding of the learning processes in both of these areas is still developing. It is recognised that the teacher needs both intense experience to introduce the principles and grounding of programming but also need sustained "just enough, just in time" support. It is also recognised that the emphasis on computer programming has distracted attention away from other aspects of the computer science curriculum and CPD including subject knowledge of, for example, algorithms, abstractions, systems and processes.

- Teachers need more time allocated to CPD.
- Teachers' timetables and workload needs to be designed to better accommodate attending CPD.
- Schools need incentives to ensure staff receive appropriate CPD opportunities.

The CAS Assessment working group did not fully pursue the CPD area of concern but the evidence from surveys, meetings and the community forum suggest that this is a key area for enabling more pupils to have the opportunity to study Computing and gain qualifications at key stage 4. It is recommended that a review of CPD is carried out and the issues better understood and communicated to the appropriate stakeholders.

Software availability

For the curriculum to have relevance and for the pupils' experiences to foster a confident approach to new technology, schools need access to a range of software including industry standard as well as open-source applications. This will help ensure students have appropriate experience of a variety of software. CAS will work to encourage the availability of less costly industry standard software for educational establishments through liaison with commercial software companies.

*The strapline of
Computing At School
remains...*

**THERE IS NO 'THEM'
ONLY US!**

We need members to step up and take action on behalf of us all.

The conclusions of this consultation exercise is that we need volunteers to undertake a range of actions. Many fall outside the remit of the CAS Assessment working group. All have implications for the success of our subject to meet the needs of our pupils, their employers and the community at large. *We need volunteers to:*

Lead a team to

consult, design and present a **subject criteria for computing** that reflects the elements information technology and digital literacy.

Be a member of the team that will... ditto.

Communicate, liaise and support the awarding organisations in proposing a **GCSE qualification** that reflect a broad Computing curriculum.

Communicate, liaise and support the awarding organisations in proposing **vocational qualifications** that reflect a broad Computing curriculum.

Communicate to the DfE and Ofqual an understanding of the **principles and values of computing** that embody much of the value of ICT and the enhancement of computer science and computational thinking so that they might make more timely and supportive decisions that enable more pupils are given the opportunity to gain qualifications in fields related to computing.

Identify and make proposals related to the costs and availability of **commercial software** to pupils studying computing.

Lead a team to

consult, discuss and present a rationale for CAS strategy regarding the provision of **continuing professional development** (CPD) and ITT.

Be a member of the team that will... ditto.

Liaise with stakeholders with regard to **CPD and subject knowledge enhancement** including the DfE, NAHT, teachers' professional associations, CPD providers (especially the Network of Excellence) to better understand the issues.

Liaise with stakeholders with regard to the **initial teacher education** of potential computing teachers including ITTE, BCS Scholarship and the DfE.

Lead a team in late 2018 to consult, survey and review the achievements, affordances and challenges with teaching the current **GCSE Computer Science**.

Be a member of the team that will... ditto.

Lead a team to

design, develop and promote resources enabling all pupils to gain computing experience and certification - **CAS Future Citizen**.

Be a member of the team that will... ditto.

In September there will be a call for members to join the **CAS Assessment working group**. Those volunteers meet face-to-face and liaise on-line to discuss and bring clarity to the assessment of all aspects of computing at all levels and for all learners.



This report has been compiled by members of the CAS Assessment working group; it is a consensus. However, individuals may differ in opinions on specific matters. We value the contribution of teachers with posts of responsibility in schools, employees of assessment organisations and commercial enterprises and colleagues in teacher training and educational research. No inference should be made from the proposals in this report regarding the policies and procedures of individual colleagues' organisations.

John Woollard
Chair CAS Assessment working group
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