SUBMISSION FOR
INFORMATICS EUROPE
BEST PRACTICES IN EDUCATION AWARD

On behalf of

Computing At School, UK

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

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This is an institutional submission

CONTENTS

1 INTRODUCTION

Computing At School was formed in 2008 by a small group of individuals from a range of sectors concerned about the inadequate teaching of Computer Science[1] (Informatics) in school. It was born out of excitement with the discipline, combined with a serious concern that many students are being "turned off" Computing by a combination of factors that conspired to make the subject seem dull and pedestrian to school pupils. The mission of CAS is stated on its website[2] as follows:

"The mission of Computing At School is provide leadership and strategic guidance to all those involved in Computing education in schools, with a significant but not exclusive focus on the Computer Science theme within the wider Computing curriculum. Excellence in the teaching of Computing can only be made by teachers through the way they deliver the skills, knowledge, understanding and attitudes associated with the curriculum. Through the participation of the wider community we seek to support and empower each other in an inclusive and self-sustaining body so that each child has the opportunity of an outstanding computer science education. CAS achieves this by supporting and promoting all those individuals, partner organisations, companies, and university departments who wish to run CAS regional hubs, put on CPD courses, generate teaching resources etc. that support the Computing curriculum."

Six years after its inception, the landscape has been utterly transformed by CAS's efforts:

- The English National curriculum for ICT (Information and Communication Technology) has been completely reformed, and now explicitly embodies Computer Science as a foundational part of the curriculum, starting from primary school. The group that drafted the new curriculum was chaired by the chair of CAS.
- In 2008 there were no GCSEs (age-16 national examinations) in Computer Science. Now every awarding body offers such a GCSE.
- CAS is now an online community of over 12,000 members. It supports over 100 face-to-face teacher "hubs" that meet regularly to share best practice.
- The government is funding CAS to run a national programme of training for Computing teachers, to give them the knowledge and skills they need to deliver the new curriculum with confidence.

CAS is fundamentally a grass roots organisation, whose energy, creativity, and leadership comes from its members. It is a collaborative partner with BCS, The Chartered Institute for IT through the BCS Academy of Computing[3] (the learned society in the UK dedicated to promoting Computing as an academic discipline), and has formal support from major industry partners, including Microsoft Research and Google. Its membership is open to everyone, and includes teachers, parents, governors, exam boards, industry, professional societies, and universities. CAS is now recognised as an influential organisation in terms of policy and decision-making at a statutory level. In addition, CAS is the UK national subject association for teaching Computing.

[1] Throughout this submission we use the term Computer Science as synonymous with Informatics
[2] http://computingatschool.org.uk
[3] http://academy.bcs.org/

2 ACHIEVEMENTS

In this section, the major achievements of CAS will be outlined in brief. Many details that cannot be included here can be found on the CAS website[4]. The achievements can be divided into three areas:

- **Advocacy (section 2.1)**. Working to persuade the government to introduce Computer Science as a school subject, including developing a suitable curriculum.
- **Community of practice (section 2.2)**. The grass-roots development of a large supportive community, based around "hubs", where teachers could meet face to face and share resources and experiences, and an online community site.
- **Training for teachers (section 2.3)**. The implementation of a national CPD programme for teachers based on local peer-to-peer delivery.

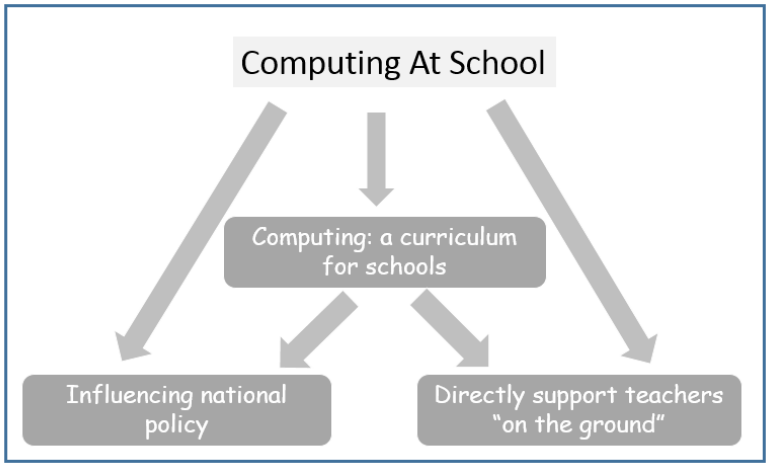

Figure 1: Activities of CAS prior to 2011

2.1 ADVOCACY

"*At its foundation in 2008, CAS seemed to fight a lonely battle against the odds. While many individuals agreed that the state of computer science teaching in UK schools was problematic, few organisations or institutions of influence seemed inclined to act to improve it." (Brown et al, 2013).*

During the first five years of CAS' existence, the CAS working group worked tirelessly to promote what they saw as the urgent need for Computer Science to be taken seriously as a school subject. In the document "*Computer Science as a school subject: Seizing the opportunity*"[5], the CAS Working Group were very clear about the reasons for lobbying for a change in the school curriculum in favour of Computer Science:

- "Computer Science is a discipline, like Maths, Physics, or History
- Computer Science is a school subject, not just a university-level discipline.
- Computer Science is educationally important.
- Computer Science is economically important
- Innovative ICT teachers are in the vanguard of the movement for change. " (CAS, 2012)

A detailed recent history of the lead up to the curriculum change in England to include Computer Science can be read elsewhere (Brown et al, 2013, Brown et al, 2014). The focus for CAS was on changing the perception of the discipline of Computer Science, including its wider utility across education. It was clear

[4] http://www.computingatschool.org.uk
[5] http://www.computingatschool.org.uk/data/uploads/Case%20for%20Computing.pdf

around the formation of CAS in 2008 that there was a profound misunderstanding of Computer Science. It was not recognised as a rigorous academic discipline, with strong theoretical foundations and a body of knowledge, distinct from developing technology competencies and digital literacy skills. Indeed, Computer Science was often conflated with ICT, or even with the use of technology to teach other subjects. These misperceptions were prevalent in government as well as the wider public.

The members of CAS believed that a simple labour shortage would be insufficient justification for changes to the curriculum -- and that a focus on only those pupils who would become computing professionals was short-sighted. The value of history in school education is not justified by a shortage of historians; physics is not taught because of the figures related to how much engineering can boost the economy. The choice of subjects, especially compulsory subjects, is driven by their value to all pupils. Thus, in promoting Computer Science CAS maintained a strong focus on the educational case for the subject, and on the transferable skills that it can yield. Often termed ``computational thinking'', these skills include logical reasoning, problem-solving, debugging strategies, algorithmic thinking, and so on.

The success of CAS at policy level was boosted by several factors. One factor has been the support of industry and other bodies to whose needs government was attentive; another, the broader international focus on computing education and digital skills; another is the composition of the CAS member body: teachers. Being an organisation that represents thousands of school-teachers gave more weight than being purely a lobbying organisation. Another key factor was that CAS gained the support of BCS, The Chartered Institute for IT[6] (the UK's chartered professional society for computing, equivalent to the ACM), an established organisation, which helped to legitimise them as representing the wishes of industry as well as education.

2.1.1 A Curriculum for Computer Science

In seeking to promote Computer Science as a school subject, a group of CAS members worked over several years to develop the body of knowledge that would form the CAS Curriculum for Schools[7]. This was published in March 2012 and prior to the new National Curriculum has been used as a benchmark for teachers seeking to introduce Computer Science in their own schools.

The development of the CAS Curriculum both assisted those teachers who were keen to try to introduce Computer Science in schools but also had an enormous impact on the efforts to work with government and awarding bodies to bring in Computer Science into both the national curriculum. The content of the curriculum was endorsed by Microsoft, Google and BCS which added to the impact of the arguments.

2.1.2 Shut down or Restart: the Royal Society report

CAS's 2009 policy paper "Computing At School: the state of the nation"[8] stimulated several Fellows of the Royal Society, led by Prof Steve Furber, to propose a Royal Society project on the subject. Several members of CAS served on the Royal Society's panel, and the final report "Shut Down or Restart"[9], launched in January 2012, wholeheartedly endorsed CAS's principal policy aim of establishing Computer Science as a school subject at every level. This report, from an unimpeachable source, was extremely influential, and the Secretary of State withdrew the national programme of study for ICT shortly after the report was published in order to give schools room to innovate.

2.1.3 2014: A new National Curriculum for England

The entire new National Curriculum in England was due for review in 2011--2012, and thus was fortuitously timed with respect to the resurgence in Computer Science, and the negative opinion of ICT. In the end, the

[6] http://bcs.org.uk
[7] http://www.computingatschool.org.uk/index.php?id=cacfs
[8] http://www.computingatschool.org.uk/data/uploads/CAS_UKCRC_report.pdf
[9] https://royalsociety.org/education/policy/computing-in-schools/report/

Department for Education invited BCS and the Royal Academy of Engineering to convene a representative working party to draft the new Programme of Study for Computing. The chair of CAS was invited to lead the group.

The final three-page Programme of Study[10] that emerged from the review was published in September 2013, for first teaching in September 2014. The aims [our italics] of the new curriculum are that **all** pupils (from primary school onwards):

- *can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation*
- *can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems*
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- are responsible, competent, confident and creative users of information and communication technology

The subject was deliberately re-titled as "Computing" rather than "ICT", to signal the shift away from technology and towards a subject discipline, but the purposeful use and application of digital technology remains a key part of the curriculum.

The new curriculum is based on a creative view of using technology as well as involving the development of computational thinking skills and the understanding of how technology works. The subject is to be taught throughout primary school and pupils are to be taught to think algorithmically and to learn to write simple programs before they reach 11 years old.

2.1.4 New School Qualifications

Before 2010 there were *no* pre-16 qualifications (GCSEs) in Computer Science, which made it literally impossible for students to study the subject. As a direct result of advocacy carried out by CAS, one of the UK awarding bodies, OCR, launched a pilot GCSE in Computing (since re-titled Computer Science) in 2010, and all the other four awarding bodies have since followed suit.

More recently CAS has directly influenced a substantial overhaul of the post-16 (A level) qualification in Computer Science.

2.1.5 The English Baccalaureate (EBacc)

The government has been concerned by the propensity of schools to chase qualifications that allowed for easy high grades. The English Baccalaureate (EBacc) was devised as a meta-qualification intended to be a new league table measure: it combines several GCSE (General Certificate of Secondary Education) results into a single measure. The government had previously stated that the subjects included in the EBacc were fixed, but following prolonged lobbying by CAS and BCS (documented here[11]), they announced that Computer Science GCSEs would be included in the EBacc, in the sciences category. This is an important signal from the government of the respect that it holds for Computer Science and something that BCS and CAS had lobbied for.

[10] https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study
[11] http://www.computingatschool.org.uk/index.php?id=ebacc

2.2 A COMMUNITY OF PRACTICE

2.2.1 CAS Hubs

CAS is a community of practice. A central feature of CAS activity has been the formation of regional hubs where teachers meet after school, in their community with their peers to share resources, receive training, try out lesson ideas and discuss pedagogy with each other. A CAS hub is a meeting of teachers and lecturers who wish to share their ideas for developing the teaching of computing in their schools, their classrooms and their community. It is a meeting of like-minded professionals with the general objective of supporting each other and the specific aim of providing (at least) one idea that can be taken and tried in the classroom.

On many occasions, guest speakers are invited to share their own areas of expertise. Teachers also share their experiences and resources. Typically, hub meetings take place two or three times per year with about 20 to 30 attendees, although this varies. There are now more than 100 hubs across the UK, and these provide a community of practice for participating teachers where they can discuss issues relating to teaching Computer Science in school and find out about new developments and resources. Hubs are also setting up their own localised professional development sessions, for example, learning to use Scratch or Python.

The CAS hub is the "bottom line" of all CAS activity and defines the CAS ethos of collaboration, mutual support and active participation. A key strapline of CAS over the last few years has been "There is no THEM only US!" which demonstrates to CAS members that any development within CAS is driven by the members themselves, not by any sort of bureaucratic body. The CAS hub activity is a demonstration of this principle.

2.2.2 The Online CAS Community

One of the most visible achievements of CAS is the development of a thriving online community of teachers and others interested in the delivery of Computer Science Education in schools. The community has gone from strength to strength, and now there are over 12,000 members of the CAS Community online. The Community website has been designed by and is maintained by CAS members at the University of Kent. It has three main elements: Discussions, Events and Resources.

Discussions: CAS has a very lively forum where members debate all aspects of education and Computer Science Education. In addition, simple questions can be asked as members are very supportive of each other. Teachers share with each other how to teach particular topics and how to interpret the curriculum. In addition IT professionals and university academics can offer advice and a different perspective.

Events: Master Teacher events and Hub meetings can be promoted on the Community website plus other events that may be relevant to teachers. The presence of the Events pages ensures that CAS is a one-stop shop for everything a Computing teacher would need as regards their professional development.

Resources: Teachers and other CAS members are all able to upload resources to share with each other. This is one of the most popular aspects of the CAS website and has grown organically to include over 1800 resources.

The site is remarkable in its level of candour, supportiveness, and participation (Brown & Kölling 2012).

2.3 TRAINING FOR COMPUTING TEACHERS

Now that CAS's policy goals have been achieved, CAS has shifted its focus to encouraging, supporting, and equipping teachers to deliver the new curriculum confidently. The government is deliberately not playing a major role, instead standing back to allow leadership from the sector itself. CAS has stepped up to this challenge directly, and has attracted £3m of government funding to do so. This is on-going work, rather than achievement "in the bank", but much has already been done.

3 RESOURCES

The primary aim of Computing At School is to support teachers in providing an excellent Computer Science education for school students. As such we do not see our main activity as producing the actual teaching resources for the curriculum, but in up-skilling teachers to develop, share and use these themselves. Thus the "resources" available to members of CAS are those that have been provided by others within the membership. However, as part of activity we have produced a number of resources that are of great value to the community. These include, but are not limited to:

- Documentation relating to the importance of Computer Science in the curriculum
- CAS Switched On Magazine
- Primary and Secondary Guidance on the Computing Curriculum
- Barefoot Computing Primary Resources
- Progression Pathways for the new curriculum

3.1 KEY CAS DOCUMENTATION

A glance at the "Documents" tab on the CAS website will reveal a long list of documents that CAS have authored to support the development of Computer Science in the curriculum (see also the Supporting Material at the end of this submission). These include:

- CAS White Paper[12] - The initial paper that proposed the formation of a national working group to give a single voice to confronting the challenges of computing in schools.
- Computing At School: the state of the nation (Nov 2009) - A report of the Computing At School Working Group, for the UK Computing Research Committee.
- Computer Science in the Ebacc (November 2012): Report from BCS Academy, with CAS, making the case for Computer Science to be included as an option in the English Baccalaureate.
- Information pack for Headteachers (March 2012) The information pack was sent to every head teacher of a state maintained secondary school in England, in order to explain the strategic opportunities they would have from September 2012 to develop Computer Science as a rigorous academic component within a reformed ICT curriculum.
- Computer Science as a school subject (March 2012) - draws on the experience of the Computing At School Group and explains what Computer Science is, and why it is strategically important. It begins with a 4-page summary, followed by appendices that provide further background.
- A curriculum framework for Computing and Information Technology (March 2012) - Computer Science is a crucial academic strand of school education, but a rounded education in computational thinking and digital systems is broader. This document puts the pieces together, covering what is currently called ICT.
- School Infrastructure (November 2013) A guide written by CAS outlining issues confronting schools and their ICT infrastructure in their preparation for teaching Computing
- Subject Knowledge Requirements for Computer Science Teacher Training: Published by the Teaching Agency. Provides a useful summary to help those wishing to teach computer science.

3.2 CAS SWITCHED ON MAGAZINE

CAS produces a high-quality colour magazine[13] three times a year which is available on our website and also in hard copy. Printed copies are given out at CAS events such as hub meetings, Master Teacher events and conferences. It has been produced since 2009 and is very well received by our members with a wide range of articles on different aspects of the pedagogy around Computer Science in school, support for teachers

[12] http://www.computingatschool.org.uk/data/uploads/Computing_at_School.pdf

[13] http://www.computingatschool.org.uk/index.php?id=newsletter

delivering the new curriculum, and information about events that have been held around the country. The magazine follows the vendor-neutrality principle of CAS.

3.3 CAS Primary Guidance

With a new curriculum coming into the curriculum in September 2014, teachers need guidance on how to interpret it. To help teachers, CAS have published the CAS Primary Guidance[14] which seeks to clarify the terminology and content of the new National Curriculum. A copy of this document was sent to every primary school in England. The CAS Secondary Guidance will be published in June 2014.

3.4 CAS Progression Pathways

The new Computing curriculum includes Computer Science, Information Technology and Digital Literacy. With the government removing the formative assessment structure in schools known as "levels" this leaves teachers unclear how to introduce progression into the curriculum. This document attempts to map the new National Curriculum to stages of development and different aspects of computational thinking.

3.5 Barefoot Computing materials

The Barefoot Computing project[15] is funded by the Department for Education, and is developing high-quality, practical cross-curricular Computer Science resources and Computing workshops to support primary school teachers in England. It is about helping primary school teachers get ready for the Computer Science element of the new computing curriculum.

As part of the project Exemplar Teaching materials are being created by a team of practising computing teachers. They will help teachers ensure that children can make progress in a wide range of cross-curricular situations and demonstrate how subjects such as English, Maths, Science or History can be combined with, and benefit from, the new computing curriculum. The exemplar resources will be shared online and through our Barefoot workshops which start in June 2014. Accompanying the exemplar teaching materials will be a series of self-help notes designed to support primary teachers on their journey towards becoming excellent computing teachers.

3.6 CAS Community Resources

As mentioned at the beginning of this section, the primary source of teaching and learning resources for Computer Science is the teachers themselves, who upload their own resources on to the CAS Community website. Currently there are more than 1800 resources uploaded which include teachers' lesson plans, resources and schemes of work. Teachers can upload their resources, see how many people have accessed them and view comments made about them. In our recent survey, the Community Resources were the most popular aspect of the CAS Community website.

[14] http://www.computingatschool.org.uk/primary
[15] http://barefootcas.org.uk/

4 IMPACT

Computing At School (CAS) exists to provide leadership and strategic guidance to all those involved in Computing education in schools, with a significant but not exclusive focus on the Computer Science theme in the Computing curriculum. Excellence in the teaching of Computing can be demonstrated by teachers through the way they deliver the skills, knowledge, understanding and attitudes associated with the curriculum. The network of support created by CAS and the NoE seeks to build communities of practice by harnessing expertise in the teaching profession and university faculty. This is the foundation of the Computing At School ethos on top of which is built the Network of Excellence.

In this section we show the impact that CAS has had in terms of the growth of the community, the engagement of its members and the delivery and take-up of CPD offered by Master Teachers within the Network of Excellence. The achievements of CAS detailed earlier in terms of its influence on curriculum change and development are of course also impactful but do not need to be repeated here.

4.1 THE CAS COMMUNITY

At the time of writing there are over 11000 members of CAS and 108 CAS Hubs. 1800 resources have been uploaded by CAS members to date, and there were over 1900 comments on the discussion forum in the last month! Figure 2 shows the membership growth at the time of writing. Figure 3 demonstrates the spread of representation amongst our membership. Of those who declare their affiliation, 67% are teachers, 15% are IT professionals and 8% are from Higher Education. This mix of individuals all interested in the development of Computer Science Education in schools provides a synergy of mutual support and enthusiasm amongst CAS members.

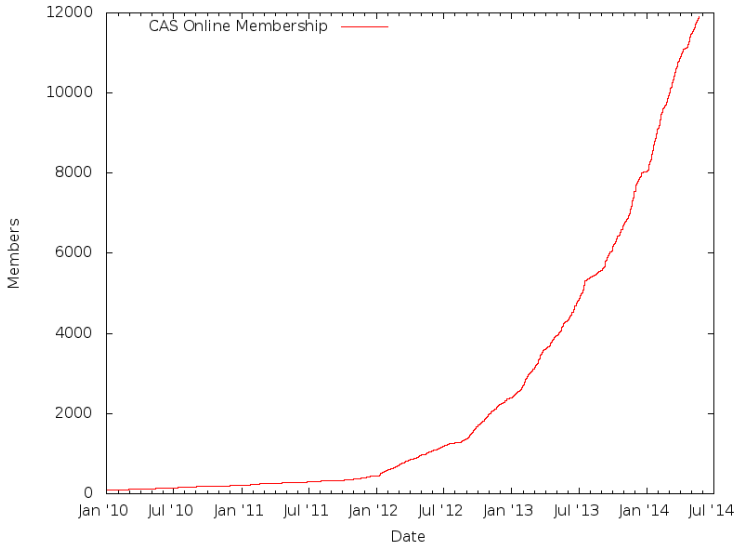

Figure 2: CAS Membership growth to May 2014

Of teachers in CAS the greatest percentage teach at secondary level (36 %) but the number of primary teachers has been growing very steadily of late (17%), with the imminence of our new curriculum in England.

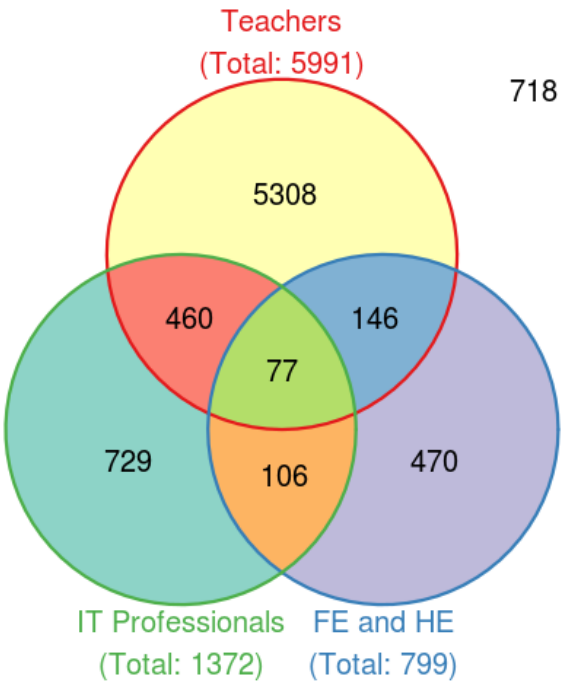

Figure 3: Representation of CAS members

4.2 CAS HUBS

There are now over 100 hubs across the UK; unlike the Network of Excellence, CAS Hubs are a UK-wide facility. CAS hub meetings are held after school for groups of teachers in areas across the UK to discuss CS teaching issues. Hub events are advertised through the CAS Community using a booking system to which all hub leaders have access. With the number of hubs growing so have the number of events, with 221 hub events from September 2013 to date compared to 107 hub events during the same period in the previous academic year.

As the number of hubs increases, so does a teacher's proximity to a hub. This is a major impact factor. If teachers have a local hub within 20 miles of them, they are more likely to travel there for a meeting at the end of the school day. Figure 4 shows the proximity of teachers to their local hubs, and from the graph it can be seen that 90% of CAS members have a CAS Hub within 20 miles.

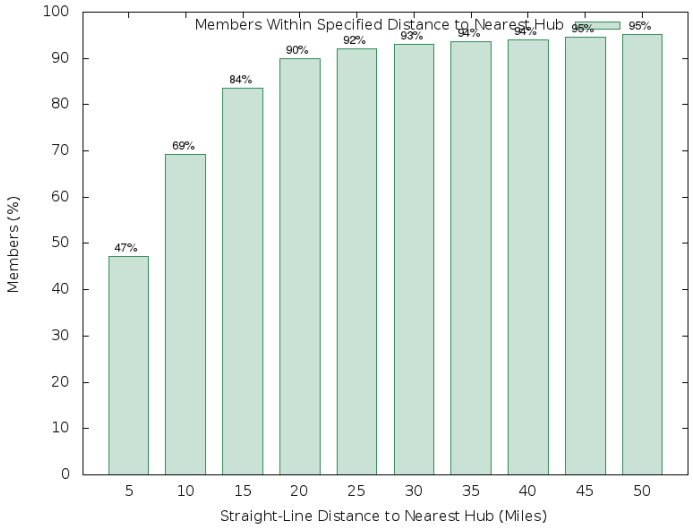

Figure 4: Proximity of CAS members to hubs

4.3 NETWORK OF EXCELLENCE EVALUATION

The Network of Excellence builds on the foundations created by the Computing At School regional Hubs, connecting teachers with other teachers and with university Computer Science and Education departments. It also connects schools to IT professionals in their locality; provide courses in both subject knowledge and pedagogy in their local area; access the experience and expertise of teachers to support their colleagues in both primary and secondary schools and provide career development opportunities for teachers.

As a teacher professional development programme, the aim of the Network of Excellence is to impact on teacher practice in the classroom. Positive impact here will have a corresponding impact on both student motivation and student achievement. The professional development model of the Network of Excellence is founded on the concept of "Master Teachers". It subsumes the ideas of cascading good practice, working within a supportive community and empowering professionals. A new Master Teacher is not chosen for this role because they are already a 'master' teacher; rather, by their participation in the programme they grow to become a specialist lead in their locality offering support to other teachers wishing to develop their own professional skills and subject knowledge. Our premise is that good professional relationships between supportive peers underlie the best and most effective teacher professional development.

Teachers in CAS can access support in many different ways within the Network of Excellence:

- Attending a local hub meeting
- Attending a session run by a local Master Teacher
- Other communication with and support from a local Master Teacher
- Attending a session run by their local university
- Carrying out a classroom research project/investigation in their school.
- Discussions with other teachers on CAS Online
- Passing on what they have learned within their department/school
- Working towards the BCS/CAS Certificate of Computer Science teaching

The aim of CAS is to facilitate excellence in the teaching of Computer Science in school. The journey to this point will be different for different teachers; also we recognise that the Computer Science element of their role may have more or less priority depending on their professional role. However the work done by the Network of Excellence has already seen the emergence of some inspirational teachers who not only excel within their own classrooms but are willing to make significant contributions to the wider community of Computer Science teachers within CAS and beyond.

Continuing Professional Development is not something that is done to teachers. We recognise the need to improve both our practice and subject knowledge but it requires a responsibility to seek this out, to tap into the knowledge and experience of other practitioners. The expertise needed is in our local community, in our neighbouring school or university and CAS with the NoE helps teachers make those connections. The implementation of the model is dependent on willing and engaged teachers, with supportive Head Teachers and leadership teams, who form the community of practice and make it happen.

At the time of writing, we have over 1100 registered schools within the Network of Excellence, with over 300 Lead Schools. There are 79 universities affiliated to the Network of Excellence who work in a variety of ways to support teachers. Within the scope of the project, we are aiming for 400 Master Teachers to be appointed by March 2015; currently we have appointed 290. Some of these are on specially designed subject knowledge training courses that are run by our partner universities in England. This training, known as the L1 Master Teacher training programme, offers bespoke subject knowledge training to experience teachers who will then become a L2 Master Teacher in the following year. Other teachers who have sufficient subject knowledge already become L2 Master Teachers at the outset.

We have appointed 18 regional coordinators each to manage a team of local Master Teachers and provide support and encouragement.

61 official Master Teacher events held in the last 12 months with 750 teachers. In addition, other activity by Master Teachers has been collated, which amounts to 750+ hours of additional continued professional development, including visits, phone calls, hub support as well as formal training in the last six months. This latter activity has impacted on more than 7500 teachers.

We are also conducting a full evaluation of the impact of our programme on teachers and schools. We have put in place a system of feedback to be gathered after each event. Through collecting this data we know, for example, that of 523 teachers recently surveyed at the end of their course with a Master Teacher or Network of Excellence university, 94% said that they would recommend the course to others. The feedback after each event is followed by an impact survey which is sent to the teacher 10 weeks after the training event they have attended. This gives CAS more detailed data on the impact the CAS training has had on their teaching practice, their school and their students. The third element of our evaluation is individual interviews with teachers which will take place by telephone starting in the summer of 2014.

We also conducted a survey of all CAS members in February 2014 which we will repeat in a year's time. This allowed us to find out what CAS members valued and needed and is reported on below.

4.4 2014 CAS National Survey

The CAS National Survey ran in February 2014 and elicited 1417 responses.

81% of those answering the survey were teachers and the response rate represents 12% of the membership at that time. The largest percentage (33%) reported that they had become aware of CAS by a recommendation from a colleague, and reading the CAS Switched On Newsletter was another significant entry to CAS for others.

The survey reveals how much CAS members use the website and which aspects of it they would refer to most frequently. All CAS members by default have a daily digest of discussion items they subscribe to (which can be turned off). The most popular aspects of the website are the discussion forums and resources with 56% of respondent reporting that they looked at the discussion forums weekly or more often and 60% of respondents reporting that they looked at the resources weekly or more often. The resources have evolved on the CAS Community website through the willingness for teachers to share what they have used and this is much appreciated by other teachers.

Survey participants were asked to rank the most useful aspects of CAS for them the data shows that the resources were the most valued aspect of CAS with the runner up being "Discussions about approaches to teaching".

17.8% of participants in our survey regularly attend their CAS Hub with 27.3% going along less regularly. The hub is the core CAS activity that represents the way CAS members can work together locally. Respondents were asked how far they would travel to a hub with 84% saying that they would travel at least 5 miles to attend their hub and 38% stating that they would travel more than 15 miles to attend a meeting.

New funding received by Microsoft[16] aims to double the number of hubs (currently 108) and when we repeat the survey next year we will be looking to see if this figure increases.

When teachers and other participants were asked what the one most important aspect of CAS was for them, the resources came out top (28.9%), but this was very closely followed by the guidance on teaching the Computing curriculum (27.9%) that members also feel to be a benefit of CAS (see Figure 5).

[16] http://www.computingatschool.org.uk/index.php?id=countdown-to-computing

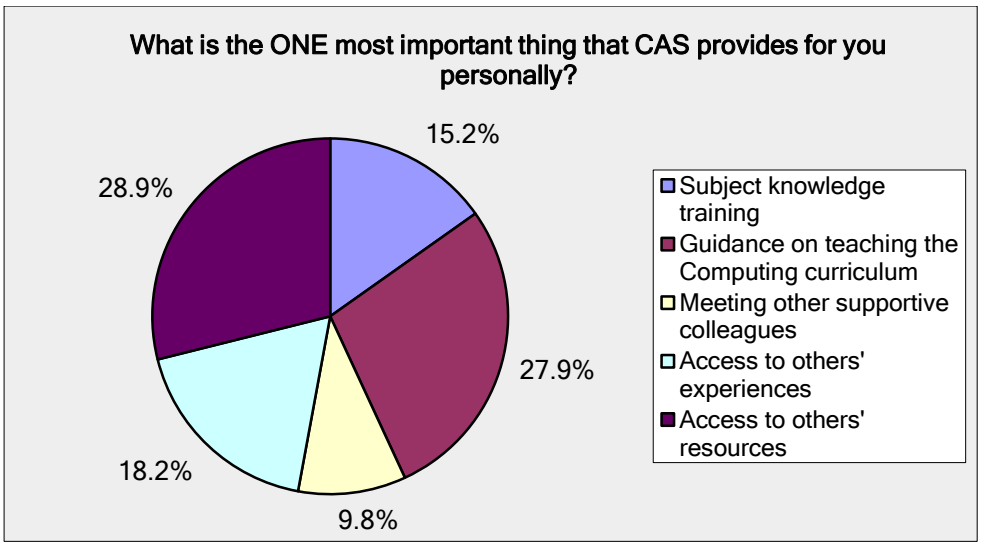

Figure 5: The one most important thing that CAS provides for you

CAS is an organisation with many keen members and very few staff and most of the activity within CAS is carried out by members through their willingness to give of their time and skills. This is indeed how CAS has achieved so much through being a grass-roots organisation. Figure 6 shows that 62% of participants made contributions to discussions which is a very high percentage of the membership compared to many other forum-oriented community websites, where there are more people just reading posts (lurking) but not actually contributing. Also 46% of those surveyed felt that they supported colleagues through CAS which is great. 41% have uploaded resources and 21.5% have delivered CPD events. We value and encourage the contributions of all our members.

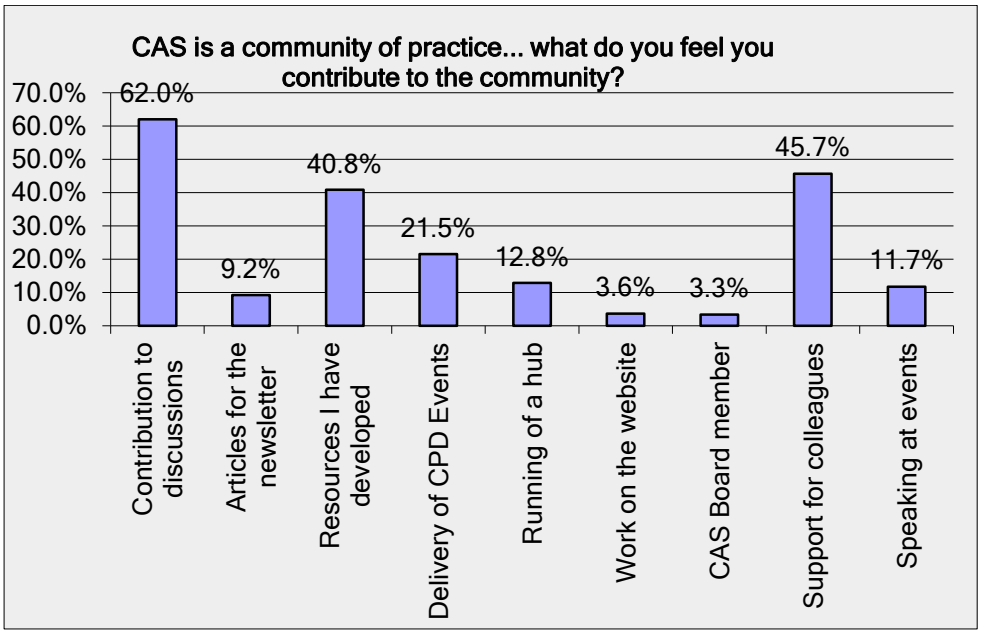

Figure 6: Contributions to CAS

A more detailed report on the survey results can be found on the CAS Community website[17].

[17] http://community.computingatschool.org.uk/resources/2115

5 CONCLUSION

Computing At School (CAS) exists to provide leadership and strategic guidance to all those involved in Computing education in schools, with a significant but not exclusive focus on the Computer Science theme within the wider Computing curriculum. Excellence in the teaching of Computing can be demonstrated by teachers through the way they deliver the skills, knowledge, understanding and attitudes associated with the curriculum.

CAS is a grass roots organisation, whose energy, creativity and motive force comes from its members. CAS has a particular focus on the school curriculum, and on supporting teachers to deliver that curriculum in the classroom, with confidence and enthusiasm, through building local communities of practice.

The impact of CAS is wide-ranging and impressive. In England we are now in a position where Computing as a subject encompassing Computer Science, Information Technology and Digital Literacy will be taught in all schools from ages 5-16 from September 2014. This represents a seismic change to the curriculum and ensures that every single child in England will have access to an education in Computing. To a teacher in the UK we represent a source of support, resources and professional development, which enables or will enable them to deliver a high-quality Computing education.

Computing At School has made a significant and impressive impact on Computer Science education in schools, which is not only benefitting teachers and students in our schools, but has proven to be of wider interest to the international community.

6 SUPPORTING MATERIAL

2008

A Rationale for GCSE Computing (Aug 2008) This document argues the case for creating a GCSE (qualification taken by students at age 16) in Computing.

2009

Computing At School: the state of the nation (Nov 2009) - A report of the Computing At School Working Group, for the UK Computing Research Committee.

2010

CAS (2010). CAS White Paper (August 2010) - The initial paper that proposed the formation of a national working group to give a single voice to confronting the challenges of computing in schools.

Royal Society Call for Evidence (Nov 2010). The BCS/CAS response to the Royal Society's call for evidence relating to Computer Science and ICT in school.

2011

BCS Computing Fact Sheet (June 2011) - Why Computing education is important for the UK, prepared by BCS Academy.

Submission to the Curriculum Review (April 2011) - Copy of the joint BCS and CAS response to the review of the National Curriculum

BCS (with CAS) E-Baccalaureate submission (Mar 2011) - Copy of joint BCS CAS submission to Education Select Committee on the proposed English Baccalaureate.

Crick, T and Sentance, S (2011). Computing At School: Stimulating Computing Education in the UK. Proceedings of the 11th Koli Calling International Conference on Computing Education Research, ACM

2012

The Royal Society (2012**).** Shut down or restart: the way forward for computing in UK schools. The influential report on the state of Computer Science education in the UK, including 11 key recommendations including the renaming of the school subject to Computing, which would include Computer Science, Information Technology and Digital Literacy.

Subject Knowledge Requirements for Computer Science Teacher Training (2012): Published by the Teaching Agency. Provides a useful summary to help those wishing to teach computer science.

Computer Science in the Ebacc (November 2012): Report from BCS Academy, with CAS, making the case for Computer Science to be included as an option in the English Baccalaureate.

Woollard, J and Bradshaw, P (2012). Computing At School: an emergent community of practice for a re-emergent subject (July 2012) Paper presented at International Conference on ICT Education 2012

CAS, Naace, ITTE Joint Statement (June 2012) A joint statement prepared by CAS, Naace and ITTE about Computer Science and ICT in schools

Computer Science as a school subject (March 2012) This document draws on the experience of the Computing At School Group and explains what Computer Science is, and why it is strategically important. It begins with a 4-page summary, followed by appendices that provide further background.

A curriculum framework for Computing and Information Technology (March 2012) . Computer Science is a crucial academic strand of school education, but a rounded education in computational thinking and digital systems is broader. This document puts the pieces together, covering what is currently called ICT.

Brown, N., Kölling, M (2012). A tale of three sites: resource and knowledge sharing amongst computer science educators, Proceedings of the ninth annual international ACM conference on International computing education research, ACM 2012.

Sentance, S., McNicol, A., Dorling, M. and Crick, T. (2012). Grand challenges for the UK: Upskilling teachers to teach Computer Science within the Secondary Curriculum. In Proceedings of WIPSCE '12, November 8–9, 2012, Hamburg, Germany.

Sentance, S., McNicol, A., and Dorling, M. (2012). (2013). Computer Science in secondary schools in the UK: ways to empower teachers. In I. Diethelm and R.T. Mittermeir (Eds.): ISSEP 2013, LNCS 7780, pp. 15–30, 2013.Springer-Verlag Berlin Heidelberg 2013.

2013

Primary Guidance (November 2013) A practical and informative guide written by CAS especially for primary schools in their preparation for teaching the new curriculum

School Infrastructure (November 2013) A guide written by CAS outlining issues confronting schools and their ICT infrastructure in their preparation for teaching Computing

Programme of Study for **Primary** Schools(September 2013). The new programme of study for Computing which will come into place in English primary schools in September 2014.

Programme of Study for **Secondary** Schools(September 2013). The new programme of study for Computing which will come into place in English secondary schools in September 2014.

Letter to Head Teachers July 2013 (July 2013) A Follow-up letter sent to all Head Teachers of secondary state funded schools in light of changes being made to the Computing curriculum

Brown, N., Kölling, M, Crick, T,. Peyton-Jones, S., Humphreys, S. and Sentance, S. (2013). Bringing Computing Back Into Schools: Lessons from the UK. SIGCSE 2013. Proceedings of the 44th ACM technical symposium on Computer Science Education

2014

Report on CAS National Survey February 2014 (Sue Sentance). A summary of the responses made to a national survey of CAS members in February 2014, eliciting over 1400 responses on use and value of Computing At School from teachers and others.

Progression Pathways Assessment Framework (Mark Dorling). An assessment grid aligned to the new National Curriculum for Computing in England that guides teachers in assessment of progression from age 5 to 16.

Brown, N., Sentance, S., Crick, T and Humphreys, S. (to be published). Restart: The Resurgence of Computer Science in UK Schools. ACM Transactions of Computing Education.