NETWORK OF EXCELLENCE COMPUTER SCIENCE TEACHING

Run by

COMPUTING AT SCHOOL
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In collaboration with BCS, The Chartered Institute for IT

Funded by

Department for Education

Further funding from

Network of Teaching Excellence in Computer Science

DfE end of grant report, 2015

April 2015

The Network of Teaching Excellence in Computer Science is run by BCS and CAS, with funding from April 1st 2013 to March 31st 2015.

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Executive Summary

This report marks the end of the period funded by the second grant from DfE[1] for the Network of Teaching Excellence in Computer Science (NoE), which ran from April 1st 2013 to March 31st 2015. The purpose of the NoE is to establish a national community of professional practice, with Master Teachers across the country acting as local champions for computing. At the end of this current DfE grant for the NoE we (the Computing At School group - CAS), can reflect on the successes and lessons learned. These will be factored into the next phase of developing teaching competency for this new subject of Computing that only became statutory in state funded schools in September 2014.

Since the start of the NoE in September 2012 we estimate 40,000 teachers have received training and support from the cohorts of CAS Master Teachers, CAS Lead Schools and CAS University Partners as part of the programme through both core and extended activity. The training and support has taken many forms. Professional development is a very human and social process, it is based on professional relationships and creating a virtuous cycle that improves the confidence levels of the people involved. The goal has been to birth and nurture professional communities of practice in local areas led by participants in both the CAS Community through the regional hubs as well as those charged with responsibility through the funded NoE programme.

From a recruitment target of 400 Primary and Secondary Master Teachers the programme has achieved 380 (see below) representing 95% fulfilment. Given the ambitious nature of the target for the primary cohort of Master Teachers, which we noted early on in the programme was very challenging indeed, it is a significant achievement to have reached this level of recruitment given the financial constraints of the grant.

Schools are gradually recognising the benefits of being part of the NoE and 20 new schools are, on average, registering to join each month. The examples shown by the Lead Schools, who receive no direct funding, unless they have a Master Teacher on staff, is illuminating and shows what can be achieved when the senior management of a school actively support their staff in the development of Computing in their school.

Our University Partners continue to contribute much to the NoE through CPD courses, conferences, Master Teacher Training and much more including providing much needed coordination of NoE with the wider CAS community activities and other stake holders. Their role as guardians of the subject at this fragile time cannot be underestimated and we look forward to the development of their role and influence in the next phase of the project (which we refer to as Phase 2).

From feedback received from Master Teacher run training events we can get an overview of the impact the training is having on teaching practice. They show a 33% increase in teacher

[1] The Department for Education, the UK Government department responsible for England

confidence as a direct result of Master Teacher training and 98% of attendees report the courses they attended have a direct impact on their teaching practice, which is hugely encouraging. Those attending these courses appreciate that they are face to face, local and led by credible, well informed colleagues. It is worth noting the teachers who received training and support through our programme have shown considerable dedication and often worked evenings and weekends in seeking to improve their teaching skills.

Is this task now complete? No! Ensuring that every child, in every generation, has an outstanding computing education is a long term challenge, it will not be met in either the short or medium term. The NoE approach of leading from the classroom is having a systemic impact and with the right long term support will significantly improve our chances of ensuring every child does get an outstanding computing education.

Headline totals over the grant period

Master Teachers (recruited): 380

- Primary: 195
- Secondary: 167
- Coordinators: 18

Member Schools: 1424

- Primary: 504
- Secondary: 942

Lead Schools: 435

- Primary: 168
- Secondary: 298

Universities

- 89 in UK
- 78 in England
- 8 in Wales
- 3 in Scotland

NoE Rationale

From the outset the aim of CS and thus the NoE has been to build fires of activity in local communities led by peers, supported by academics and other professionals. Change management has been problematic for many teachers of Computing moving from the old ICT curriculum to the new computing programme of study. For most the keyword is **confidence**. The target for all our activity has been to raise that level of confidence in the teachers' own ability to teach computer science[2].

[2] The new computing curriculum is composed of computer science, IT and digital literacy. Computer science is completely new to virtually all teachers and hence is the focus of our activity.

Professional development takes many forms including training, workshops, peer collaboration, online courses and networking activity, mentoring and coaching. The NoE has sought to build on the principles of local, face to face support using mentoring, peer to peer support and cascade of subject knowledge via accessible role models namely the Master Teachers. This has been supported through the pre-existing online CAS community site.

The number of teachers participating in our activity has grown from approximately 2000 midway through 2012 to just under 18,000 in March 2015. The teachers in our network have had access to a variety of professional development opportunities inc:

- Attending local hub meetings
- Attending sessions run by a local CAS Master Teacher
- Various types of mentoring and coaching support from a local CAS Master Teacher
- Attending sessions run by their local university
- Carrying out a classroom research project/investigation in their school.
- Discussions with other teachers on CAS Online
- Sharing knowledge and experience through activities within their own department/school
- Working towards the BCS/CAS Certificate of Computer Science teaching

The aim of any teacher professional development programme is to impact on teaching 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” as key stakeholders in shaping development opportunities in their local communities. It includes the ideas of cascading good practice, working within a supportive community and empowering professionals. It is to be noted that 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.

The aim of CAS is to facilitate excellence in the teaching of Computer Science in school. The journey to excellence will be different for different teachers; also we recognise that the computer science element of their teaching 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 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.

Master Teacher Programme

The core activity of the Network has been to find, recruit and train a cohort of experienced classroom practitioners to be local champions, trainers and sources of advice for other

teachers in their area. Known as 'CAS Master Teachers' the target was to recruit 400 during the two years of the project. To date 380 have been recruited and is summarised in table 1.

The Master Teacher Programme has three levels of engagement:

- Level 1 (Trainee) CAS Master Teachers
- Level 2 CAS Master Teachers
- CAS Master Teacher Regional Coordinators

Those experienced classroom practitioners with insufficient subject knowledge to teach computing at their educational phase (key stages) started at Level 1 and were provided with subject knowledge training through a network of participating universities (see below). "Insufficient subject knowledge" was define with reference to the Subject Knowledge Requirements for Computer Science Teacher Training published by the Teaching Agency (now NCTL) which was used as the basis for this and supported by a subject knowledge audit tool developed in association with the Gatsby Foundation.

Those recruited with sufficient subject knowledge were accepted as Level 2 Master Teachers and assigned a Regional Coordinator who worked with their cohort as they built their communities and ran CPD sessions. The Regional Coordinators were tasked with sharing their expertise and experience with Level 1 and Level 2 CAS Master Teachers in order to make their CPD sessions more effective and have greater impact in the classroom.

Each Master Teacher was expected to run a minimum of three CPD events for teachers in their area based on an assessed need determined through a simple survey. In addition they were encouraged to provide support in other ways e.g. presenting at CAS hub meetings, responding to requests for help through email, phone or school visits, advising others e.g. University Partners, participating in training organised by other organisations.

Master Teacher Recruitment

The target was to recruit and train 400 Master Teachers and we have succeeded in recruiting and providing training to 380. Challenges with recruiting Primary Master Teachers were flagged very early and to be 19 short of the target overcomes our initial concern by some margin. It would have been easily possible to recruit those extra Primary Master Teachers from secondary teachers with primary experience, but in consultation with DfE it was agreed we would not adopt this strategy and that instead we would use programmes such as the Barefoot Computing project to generate primary interest in computer science that over the long term would encourage more primary schools to join the NoE. To date around 11,000 primary teachers have now registered with the Barefoot Computing project, which shows that approach is working.

Table 1: Summary of Recruitment to Master Teacher Programme

	Primary Level 1	Primary Level 2	Secondary Level 1	Secondary Level 2	Total	Regional Coordinator
Recruited	102	93	48	119	362 (380)	18
Active	93	83[1]	40	108[2]	331[3]	18[4]

Notes:

1. Of the 83 there were 25 recruited at L1 who have graduated to L2 – these have not been counted in the Current Level 1 figures
2. Of the 108 there were 22 recruited at L1 who have graduated to L2 – these have not been counted in the Current Level 1 figures
3. This total only counts the RCs once ie not at L2 and RC
4. Of the 18 we have 2 included in Primary L2 MT figures and 9 are included in Secondary L2 MT figures

Those withdrawing from the programme represent a natural churn with reasons cited as e.g.

- Temporary change in circumstance (professional or personal)
- School commitment to teaching school or others
- Permanent withdrawal e.g. due to career change
- Lack of SLT support

Level 1 Training Programme

University providers were appointed to provide the subject knowledge training for the Level 1 cohorts. Grants were made available to provide:

- Up to 5 days training for primary teachers
- Up to 10 days training for secondary teachers
- One to one supervision for all

Six universities were selected for the first cohorts of Master Teachers expanding to 14 in the second year. Each Master Teacher is assigned to the University of their Choice where possible and each university is encouraged to share resources between each other and conform to an agreed standard of delivery and assessment of impact overseen by a member of the NoE Team. The training and assessment of impact is ongoing for many of the current Level 1 Master Teachers.

In an effort to get the Level 1 Master Teachers up and running as quickly as possible as Level 2 Master teachers after completing their level 1 programme, many have attended their Level 2 training before graduation. All Level 1 Master Teachers are also encouraged, through

their Regional Coordinator to “buddy up” with a Level 2 in their area for mutual collaboration and support.

Wider benefits of training programme

The training programme has had a positive impact enhancing the Computing capability of in service teachers. The participating teachers as well as feedback from observations/QA visits identified the following benefits:

- the trainers appreciate their participating teachers' wealth of skills and experiences and provide them with opportunities for dialogue and exchange of ideas at local, regional and national level;
- the L1 training programmes provide strong links between theory and practice as well as links to a wealth of resources that can support learning and teaching;
- the rich opportunities to develop Computing skills are contextualised within rigorous pedagogical approaches- the teachers are learning ways to disseminate their new knowledge to colleagues (CPD opportunities), plan lessons that support Computational Thinking and monitor their pupils' progress;
- the work produced by the participating teachers is creative, thorough and reflective;
- providers have been keen to personalise the training to suit their teachers' individual needs and ensure that all the participants are developing skills, knowledge and understanding across the 5 strands of the CAS Subject Knowledge Curriculum/Framework;
- the courses are led by enthusiastic and knowledgeable colleagues with experiences as teaching professionals, computer scientists, teacher educators, researchers- great combination of skills to support their teachers' reflections and professional development.

Level 2 Master Teachers

The role of the Master Teacher covers a variety of activity but focus was given for the Master Teachers to support 40 other teachers through their activity. To simplify payment structure and to help them achieve this they were asked to deliver 3 local CPD events. Funding to their schools in return for some release time for their role was issued in stages based on their level of progress in (1) planning their events, and (2) delivering the events. Master Teachers were also encouraged to participate in other ways as highlighted above and invited to share that other activity with the NoE Team to build a picture of depth of engagement in their wider community.

Master Teacher Events

Table 2: Master Teachers Events

	MT Total	Number of events advertised during winter term 2014 and spring term 2015 (which could also run in the summer term):
Level 2 MTs (all)	144 [1]	286 (66.2%)
Level 2 MTs (funded)	85	222 (87.05%)
Level 2 MTs (unfunded)	59	64 (36.15%)

Note:

1. There are a total of 191 Master Teachers at Level 2. In the spring term 2015 a total of 47 graduated to Level 2 but were not eligible to be included in the figures above.

School grants are only available for one year. After which the Master Teachers are expected to continue in their role, in return for the enhanced status provided by the title. APPENDIX X contains two tables comparing the activity of the funded and unfunded Master Teachers sorted by region.

There has been regional variation due, usually, to activity and effectiveness of the Regional Coordinators. Sharing the good practice of those most effective has been helpful in building further support for all into subsequent training for the Regional Coordinator Team. However, enabling the unfunded Master Teachers is a constant challenge and it is clear that providing grants to their schools provides both reason and obligation to fulfil their role.

Many reasons have been identified for this lower than expected/hoped activity e.g.

- Lack of time from school
- competition from other organisations
- lack of support from senior management
- change in personal circumstances
- changes in school circumstances i.e. colleagues leaving or off sick

However, although they haven't all been running CPD events, they have been incredibly active and the "other activities" data reflects this and is highlighted later.

Attendance to events:

The CPD Needs surveys run by Master Teachers and the cry heard from hub meetings and elsewhere for access to training illustrates the need and demand for the work of the Master Teachers. This level of demand is not reflected, however, in attendance at Master Teacher events.

Attendance (See APPENDIX Y) is particularly low for those in their first year of the Level 1 programme. Whilst ideally this would not be the case, it is not entirely surprising while they are building their community of practice and getting known in the area. Those in their second year see increased participation. The proposed development of Regional Centres will greatly assist the level of support for this group. Again, learning from those where attendance is much higher and sharing the good practice has been invaluable.

Other Master Teacher activity

The Master Teachers have been working exceptionally hard to build their communities of practise beyond the three CPD events they are asked to run. 86 of the 144 (59.7%) Level 2 Master Teachers have completed and returned the "other activities" audit for the winter term 2014 and the Spring term of 2015. Each activity undertaken is, where possible, recorded and broken down by category as per the NoE model of CPD[3] (see TABLE 3).

Table 3: Breakdown of Master Teachers' other activity

	Count	Hours of CPD	Teachers supported
Action Research:	1	N/A	N/A
Cascade	87	225.4	1388
Communities of Practice	26	46.5	297
Mentoring/Coaching	105	262.9	363
Training	320	1083.5	6694

There are many excellent examples of Master Teachers going way beyond their terms of grant and APPENDIX Z summarises, from an unfunded Master Teacher, just one example.

The total number of teachers supported via Master Teacher activities (both the three CPD events and the record of extra activities) between September 2014 and March 2015 is: 9395. Since the NoE started 38,189 teachers have been supported through both Master Teacher Training events and other activity undertaken as part of their role.

Lead Schools

Each year Lead Schools in the Network of Excellence are asked to complete an audit of their activity to support their continued status as a Lead School. This report summarises the audit carried out between September and November 2014. All schools involved in this survey were asked, by email, to complete the audit by the end of September 2014. A further audit

[3] Sentance, Humphreys and Dorling (WIPSCE, 2014)

is due to be carried out in July 2015, subsequent to Computing At School being asked to continue with the NoE programme.

From the audit we can draw the following conclusions:

- Many of the CAS Lead Schools had already responded positively to the disapplication of the ICT curriculum back in 2012 and taken steps to revise their curricula and support their staff with the transition to computing. This helped them be Lead Schools in the first instance. They have naturally been recognised as leads by other schools in their area.
- Where teachers are actively supporting their colleagues in other schools their own professional development is enhanced and the status of Computing in their school is likewise enhanced. One measure is the number of pupils opting for GCSE/GCE Computer Science, several schools commented on significant increases in GCSE numbers e.g. “84 Year 10”, “7 GCSE classes”, “GCSE numbers have doubled", “60 Year 10”, “Our numbers for GCSE have tripled this year". And for A Level on school noted: “Over 30 taking A Level this year"
- The most successful Lead Schools are those that have both a Master Teacher and an active CAS hub running from their school (see TABLE 4)
- The Lead School status is having a significant impact on both teaching staff, pupils and the subject in those schools in several ways:
    - it is enhancing the status of the Computing teacher in their school
    - it is providing career development for the Computing teachers
    - it is raising the status of the subject in the school

Lead Schools have not received any direct funding for the activity they have undertaken in their locality and are one of the biggest success stories of this programme.

Table 4: Lead Schools with/without Master Teacher

	Primary	Secondary	Middle/All through	Total
Schools in the NoE	360	764	289	1413
Lead Schools in the NoE	138	251	57	446

Note that all Level 1 Master Teachers are at Member schools in NoE. When level 1 masters graduate to Level 2 programme - there schools will be automatically upgraded to Lead School from current status of member school.

CASE STUDY 1: Beckfoot School, Bingley. HOD: Neil Kendal

This year our GCSE Computing course has two classes. In previous years it has only been one. Our department has joined with the maths faculty to promote the importance of computer science. I have been appointed to the role of subject leader computer science. We are developing a KS3 curriculum that incorporates elements of IT and computer science, leading on to GCSE and A Levels in Computer Science and/or ICT. Last year we had a whole day where year 9 were out of normal lessons doing special activities around a common theme. One of the activities was computer science based (data representation and cryptography). Termly computing competitions are published in our termly newsletter. We offer a well attended after school 'gamemaking' club which is run by sixth form students. This year we entered 5 students for the British Informatics Olympiad. All of our KS3 students completed the 'Hour of Code' which helped us recruit more students for the GCSE course.

We have met several times with another local school which is introducing computer science GCSE this year. We have shared resources and have helped mark sample coursework assignments. Meetings have started with our feeder primary schools to help them to develop the new KS2 curriculum.

I regularly participate in CAS discussions and have published numerous resources, some which have been downloaded 100s or 1000s of times and received tremendous feedback. On numerous occasions people have contacted me directly from my email link on CAS.

We have started to attend meetings with our local feeder primaries to help with their introduction of the new curriculum. This will continue this academic year, probably once each term. It is expected that this may lead to after school sessions where primary students visit us to engage in computing activities.

CASE STUDY 2: Meir Heath Primary School, Stoke on Trent. SLE: Nikki Lockett (CAS MT)

We are working this term on the school's development plan where Computing will be included for all years. We run an after school Computing Club for year 5 and 6 and have been teaching Scratch including using some of the Code Club resources. I am currently leading our pyramid school meetings supporting them in implementing the new Computing POS. I have been working closely with the head of Computing at the high school who will also support with training staff members in the pyramid. As a computing SLE working for the local Teaching School Alliance, I have worked with a colleague to plan and deliver (based on CAS resources and CAS Master Teacher training) three network meeting, supporting subject leaders in Stoke on Trent Primary schools to prepare their staff for the new computing curriculum. As part of the Teaching School Alliance Computing Network meetings, we have promoted CAS to all subject leaders. During Headteacher Briefing Meetings on changes to the new curriculum, we have also drawn head teachers attention to CAS and in particular the NoE.

Within Stoke on Trent, I feel that my colleague and I have built a strong network of subject leader support as their is no longer LEA support. At my own school, time and training has been given so that teachers can plan their own cross curricular opportunities for computing.

We have two members of staff who deliver computing to Key Stage two until more staff feel confident to be able to deliver the POS.

I have made contact with the Head of Computing at our local high school who is very knowledgeable and we are working together so that his expertise, and resources, can support the feeder schools. He has agreed to attend our Pyramid meetings and to offer guidance on how we can ensure our Year 6s are secondary ready. I have also been invited as an SLE to attend an INSET day at a different secondary school who is supporting it's local primaries. My role will be to provide guidance for the high school and primaries on starting points, particularly at Key Stage 1.

CASE STUDY 3: Park House School, Newbury. HOD: Pete Marshman (CAS MT and RC)

References are made in our school development plan to innovative work carried out with primary schools which brings hundreds of primary schools to Park House to enable pupils and teachers to experience CS using kinaesthetic approaches. Park House is actively involved in new initiatives for Computing activities as a breakfast club and enters pupils for the TeenTech awards. The curriculum is enriched through attending the TeenTech Event, Digigirls and World Technology Skills. Other activities include popup Computing, Lego Mindstorm challenges and primary experience days as described above. The Thames Valley CAS hub is often hosted at Park House School. Primary teacher CS training has also been undertaken.

I coordinate the local CAS hub drawing in teachers from schools across Hampshire, Wiltshire, Berkshire, Buckinghamshire and Dorset. CAS MT training and other CPD events are also offered at the school for full day training or twilight training.

The school works in collaboration with IBM, various universities, Blackberry and other secondary schools to perform an annual computer science experience day funded by CAS, the BCS and the IET. These days enable pupils from years 3 to 5 to undertake a huge range of activities, some of the workshops offered by companies and some by trainee students at Reading university as well as the staff at PHS. This day also provides CPD for primary school teachers attending the event. These activities are cross-curricular including Art, Science, Maths, Geography and Dance. PHS is currently in collaboration with a major UK retailer to provide a breakfast club for pupils to experiment with physical Computing working alongside D&T. Extra-curricular activities are undertaken by pupils including TeenTech (Yr8), TeenTech Awards (Yr8), DigiGirlz (Year 9) and PHS has two pupils who are vital in the UK Digital Skills Task Force (Year 10/11). Support has been provided to over 12 nearby primary schools to assist with the impact of the new curriculum. Over 10 different interviews have taken place this year as art of the BCS Scholarship programme.

PHS provide primary schools to attend a CS experience day. This involves over 400 pupils from 12 different primary schools annually. Teachers also receive CPD on this day and staff from PHS have been involved in advising, delivering CPD and supporting local primary schools.

University Engagement

University partners have reported 87 CPD courses to 793 teachers in the period, amounting to 4,700 teacher hours of CPD. Including in these figures are teacher conferences organised at Edge Hill and Newcastle University. The latter attracted 200 delegates from primary and secondary schools across the North East and North Cumbria. In addition, as Barefoot Computing Regional Coordinators Edge Hill, Newcastle and Newman universities have delivered Barefoot Computing workshops to primary schools in their regions and will continue with a programme of workshops to the end of the school year. The contribution of University partners to Master Teacher training is reported elsewhere.

In addition to delivering CPD, Universities play an active, and often leading, role in local CAS hubs and in regional coordination. Since the last report regional meetings of Master Teachers, Hub Leaders and HE contacts have been organised by the Birmingham University, University of Plymouth, University College London and Southampton University.

Finally, 24 Universities responded to a request for expressions of interest in becoming CAS NoE Regional Centres. This is further evidence of University commitment to the continued success of CAS and the NoE and that the work of CAS is now seen as central to University outreach activities.

Impact

Data collection

As part of our evaluation we collect data from a number of sources

- Feedback forms which tell us the level of satisfaction from a course immediately after it has taken place
- Impact forms which tell us the impact that the training has had 10 weeks on
- Broad-based surveys which capture how many of the general CAS membership are engaging with Master Teacher training

Feedback data is taken from teachers who attended Master Teacher training courses and a small number of universities who advertise their courses through the Network of Excellence systems.

Quality of training at Master Teacher training events

We have undertaken a similar analysis to that produced in the July 2014 report and the feedback received is equally or more positive about Master Teacher events than at that point in time. 752 feedback forms have now been received of which 63 referred to events held at universities in the NOE; the remaining 689 referred to sessions held by one of 68 different Master Teachers.

- At the beginning of training the average confidence of teachers scored out of 10 was 4.1. After training the average confidence was 7.4. So on average the master teacher training raised teachers' confidence by 3.3 points on this scale (1-10)
- 99.5% of respondents said they agreed or strongly agreed that the course was enjoyable

- 99% of respondents agreed or strongly agreed that the course was good value for money
- 99% of respondents either agreed or strongly agreed that the trainer was well informed and well prepared – this is an excellent recommendation for our Master Teachers and the Network of Excellence training
- In addition 99% felt there was a good range of activities and that engagement/ direction was well-balanced
- 96% of teachers felt that they could now implement what they had learned and 98% of respondents felt the course would have an impact on their practice
- 98% then said they would recommend the training they had received to others

Contact with Master Teachers

We carried out surveys of CAS members in February 2014 and February 2015. Our wide scale survey is used for a number of different purposes to find out how teachers are interacting with CAS and what kinds of professional development they find useful.

We were able to extract just the data for teachers in England to find out how many are in contact with their local Master Teachers.

Table 5: Teachers in England that are in contact with CAS Master Teachers

	Feb 2014	**Feb 2015**
Number of teachers in England completing survey	864	981
% in contact with a Master Teacher	35.5%	41.6%
% attending more than 6 hours MT training	14%	21%
% attending > 1 hour MT training	34%	54%

The table above shows that more teachers are now in contact with a Master Teacher in just the last 12 months, and a high percentage are attending Master Teacher training. 54% of the teachers in England who completed the survey had attended some Master Teacher training, which was an increase in 20% from the previous year. This shows the increased numbers of Master Teachers are making a greater impact.

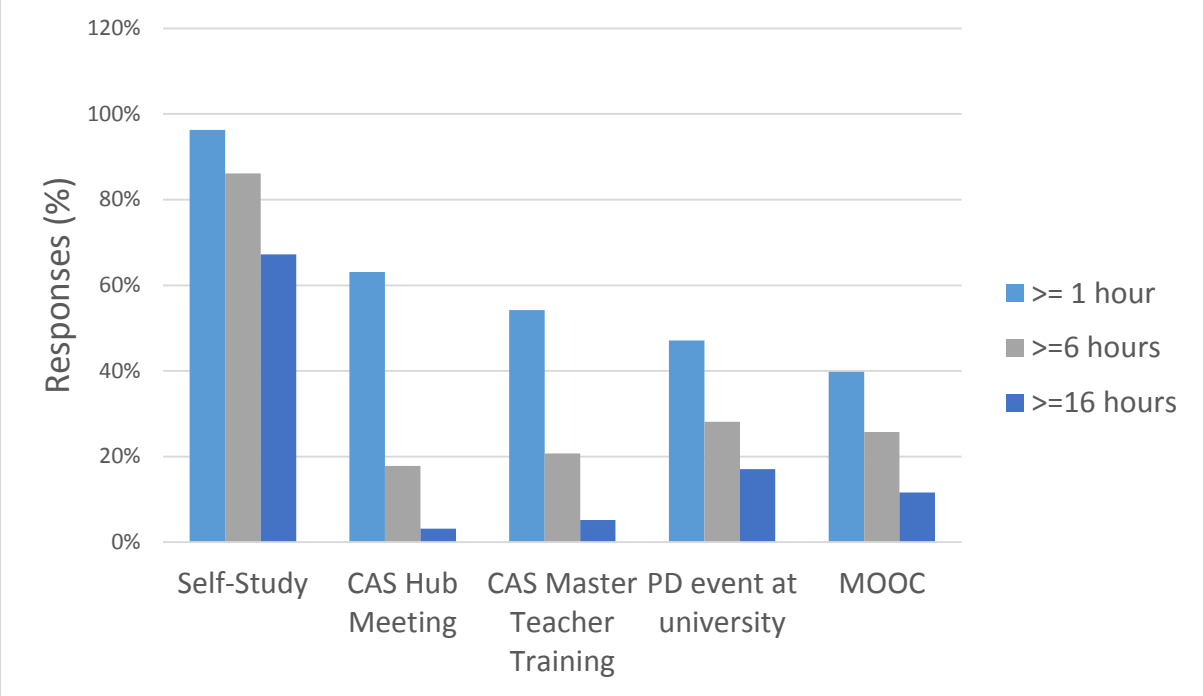


Figure 1: Type of professional development and number of hours undertaken

Figure 1 shows the number of hours the teachers participating in our survey said that they had spent on their professional development. We also asked about other types of event and the most attended were CAS Hub meetings, Master Teacher training and university NOE events. This was also reflected in how useful the teachers found the events as shown in Figure 2. That shows Primary, Middle teachers and Secondary teachers and compares data from the previous years' survey. This shows that teachers are continuing to find Master Teacher training the most useful type of CPD that they are involved with, even when compared to an increasing number of MOOCs that are available.

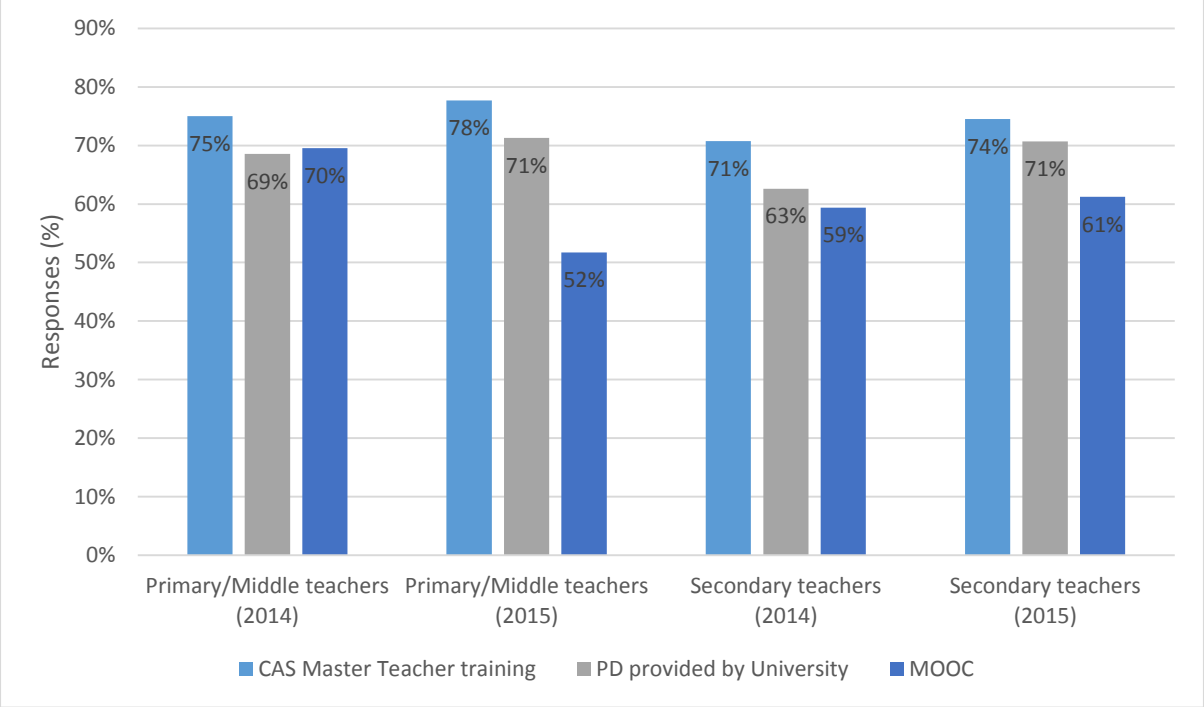


Figure 2: % teachers reporting PD type as useful/very useful

Overall 329 teachers out of 429 completing the latest survey in February 2015 CAS Master Teacher training (76%) said it was useful or very useful and another 98 saying that parts of it were useful (only 2 out of 429 said it wasn't useful to their professional development).

Impact of Master Teacher training on learners

We have been collecting data on the impact that Master Teacher Training has on different aspects of teaching and learning during the programme by asking teachers to comment on this 10 weeks after a session (i.e. effectively a term after attending the session).

Examining this data and comparing responses this academic year to last academic year we can see that although the impact on knowledge and skills is more or less the same in both academic years (see Figure 3), the impact on the learners is much greater (see Figure 4).

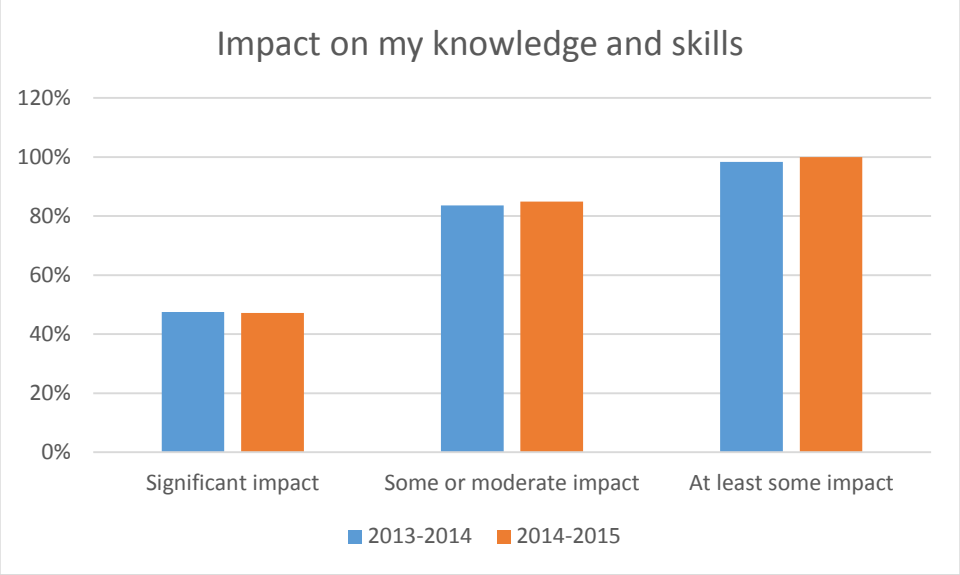


Figure 3: Teachers' report on impact of MT training on their knowledge and skills

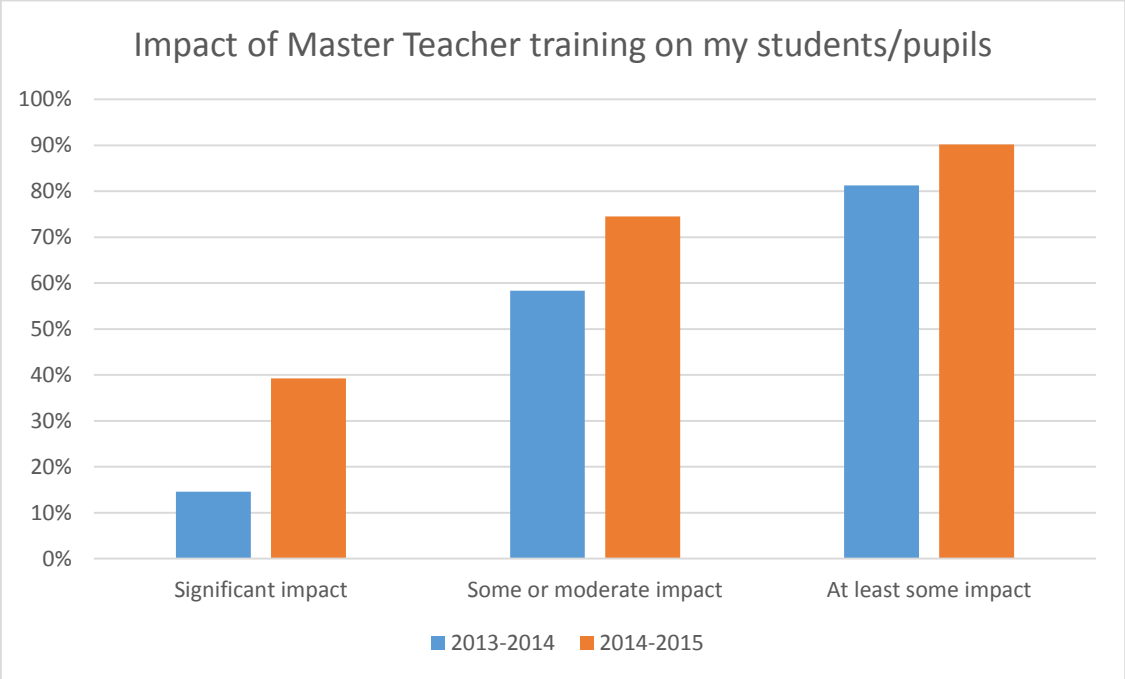


Figure 4: Teachers' reports on the impact of the Master Teacher training on their learners

As the new curriculum has been implemented this gives a direct indication that the teachers feel that the training that they are receiving from Master Teachers is having an impact directly in the classroom. Comments made by teachers support this:

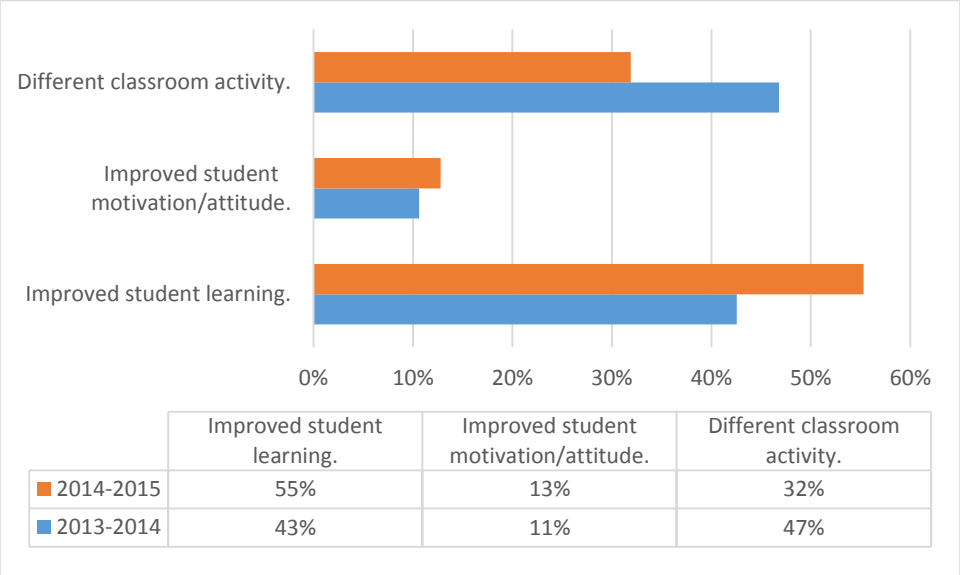
> *"It gave me confidence to know that I am covering the curriculum for my pupils and where I can extend them to if possible. Also networking with others on the course and the course leader gave me new ideas for using other software with the children"* (Primary teacher, South West region)

"*Students accessed a wider range of programmes and I was able to push higher ability children as I knew what steps of progress were expected*." (Primary teacher, North West region)

"[Students are] More motivated due to increasing the range of practical ideas" (Secondary teacher, North East)

Note that these comments are made 10 weeks after the event, and almost half of the teachers completing the survey voluntarily added a comment here.

What is also interesting is the type of impact the teachers say that the training has had on their learners (see Figure 5). Last year the impact on learners was more likely to be in the form of different classroom activities that they could participate in. This year teachers are increasingly reporting that the training has had an impact on student learning. This is a very encouraging finding.



	Improved student learning.	Improved student motivation/attitude.	Different classroom activity.
2014-2015	55%	13%	32%
2013-2014	43%	11%	47%

Figure 5: Teachers' reports on the specific impact the training has had on their learning (by year):

Teachers' confidence

Teachers who complete the CAS survey are increasingly more confident with teaching Computing. This may not reflect the country at large but demonstrates the impact that CAS has on teachers' confidence in this subject area (see Figure 6).

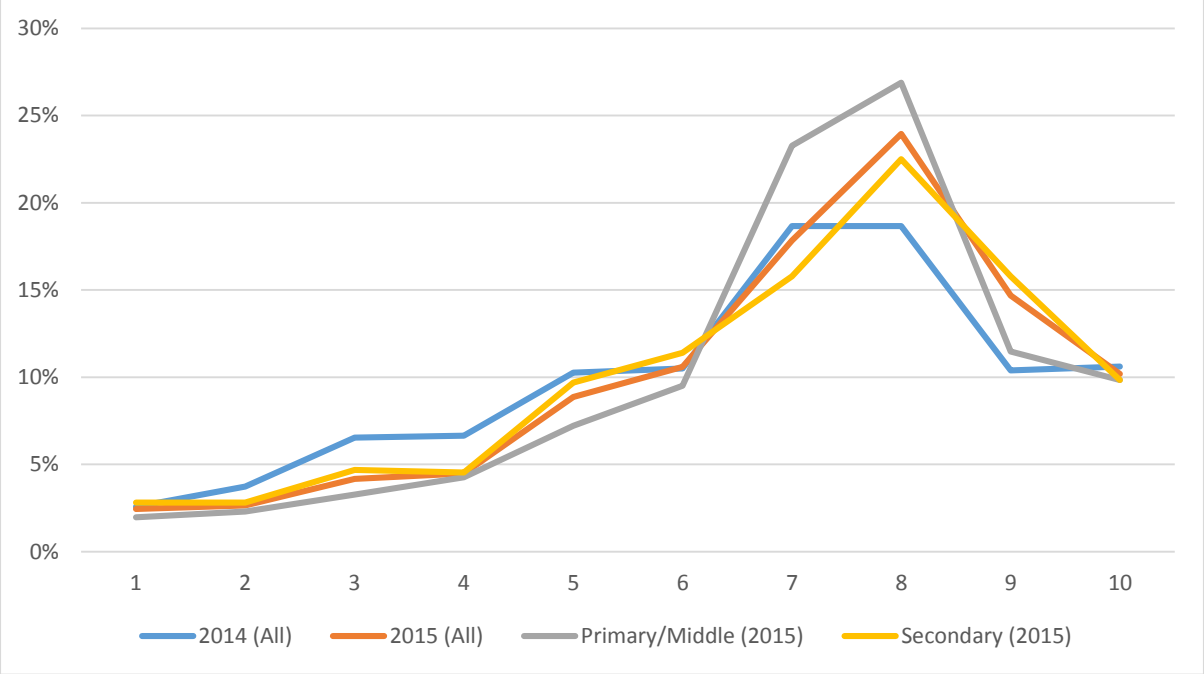


Figure 6: Self-reported confidence in teaching Computing

Legacy

The purpose of the NoE has been to build on the existing network provided through the CAS community and establish a recognised national community of professional practice, with Master Teachers across the country acting as local champions for computing. In a short space of time the role of Master Teacher has become a recognised "brand" sought after by Head Teachers and used as part of the their recruitment criteria for new appointments. There is recognition that the Master Teachers are the leaders in their field who are building the status of the subject in their schools and enabling more pupils to opt for Computer Science at GCSE.

The engagement of universities with teachers learning to teach Computing has resulted in long-term and fruitful relationships being set up between universities (both Education and Computer Science departments) and schools. This has been beneficial to both parties as academics' understanding of how their subject is taught in school is useful in any discipline. In fact, informal comments reveal that some academics in computer science departments have been exposed to more engaging ways of delivering the content through their work with some of our inspirational Master Teachers.

Some of the university academics involved with the NoE are now realising, as we do, that there is a huge need for research in this area. We need to understand more about how students' understanding of the subject area can be facilitated, particularly in the context of topics that can be difficult to teach. Whereas science and maths education have a long history, this is not the case in Computing and there is much more to find out. The CAS-Research group is both developing ideas for future research as well as encouraging teachers themselves to be more research-engaged and research-active.

Others from the network of excellence universities have become assessors for the BCS Certificate in Computer Science Teaching. We see professional recognition of teachers' competence in delivering a particular subject a very important aspect of the work of CAS and many associated with the network of excellence are supporting us in this venture.

We look forward to the next phase of the project where the development of Regional Centres, based in universities will enable penetration to those schools who have either not embraced the change or are giving it insufficient time or attention. These regional centres will be better placed to support the Master Teachers in their area and provide additional training, whatever their level. It is right that we look to the university partners to provide this focus. They are well placed to nurture the subject as well as provide logistical support to the local communities of practice in their region. The Universities provide strong links to Master Teachers, CAS hubs and the widening base of teachers attending CPD sessions each able to build the network of teachers and academics collaborating on the delivery of the new curriculum.

There is much to be done in raising the profile of the subject in schools, particularly among SLTs, and in extending the reach of the network to meet the CPD needs of teachers. The health of the discipline can be secured by building on and sustaining the collaborative model that has been developed under the NoE.

APPENDIX X

Comparison of Master Teacher events by region and grant status (funded or unfunded):

Break down by region - overall:

Region	no. MTs	Possible events	Actual events	Percentage
Jeanette Patterson	6	18	13	72.22%
Pete Dring	10	30	21	70.00%
Dave Ames	9	27	8	29.63%
Mandi Banks	9	27	18	66.67%
Carl Simmons	8	24	17	70.83%
Stuart Davison	9	27	14	51.85%
Dave Chaplain	5	15	8	53.33%
Helena Gillespie	9	27	7	25.93%
Dave White	9	27	23	85.19%
Tarisai Chikomba	9	27	18	66.67%
Trevor Bragg	9	27	27	100.00%
Aidan Delaney	9	27	24	88.89%
Phil Bagge	4	12	4	33.33%
Steve Greenhough	9	27	20	74.07%
Jason Budge	9	27	28	103.70%

John Palmer	8	24	19	79.17%
Pete Marshman	9	27	17	62.96%

Break down by region - Funded MTs

Region	**No. MTs**	**Possible events**	**Actual events**	**Percentage**
Jeanette Patterson	4	12	9	75.00%
Pete Dring	8	24	21	87.50%
Dave Ames	5	15	8	53.33%
Mandi Banks	5	15	15	100.00%
Carl Simmons	6	18	14	77.78%
Stuart Davison	6	18	13	72.22%
Dave Chaplain	4	12	8	66.67%
Helena Gillespie	3	9	6	66.67%
Dave White	6	18	17	94.44%
Tarisai Chikomba	4	12	11	91.67%
Trevor Bragg	8	24	25	104.17%
Aidan Delaney	6	18	17	94.44%
Phil Bagge	1	3	3	100.00%
Steve Greenhough	5	15	14	93.33%
Jason Budge	3	9	15	166.67%
John Palmer	5	15	13	86.67%

Pete Marshman	4	12	13	108.33%

Breakdown by region unfunded MTs

Region	**No. MTs**	**Possible events**	**Actual events**	**Percentage**
Jeanette Patterson	2	6	4	66.67%
Pete Dring	2	6	0	0.00%
Dave Ames	4	12	0	0.00%
Mandi Banks	4	12	3	25.00%
Carl Simmons	2	6	3	50.00%
Stuart Davison	3	9	1	11.11%
Dave Chaplain	1	3	0	0.00%
Helena Gillespie	6	18	1	5.56%
Dave White	3	9	6	66.67%
Tarisai Chikomba	5	15	7	46.67%
Trevor Bragg	1	3	2	66.67%
Aidan Delaney	3	9	7	77.78%
Phil Bagge	3	9	1	11.11%
Steve Greenhough	4	12	6	50.00%
Jason Budge	6	18	13	72.22%

John Palmer	3	9	6	66.67%
Pete Marshman	5	15	4	26.67%

APPENDIX Y

Number of events run between September 2014 and March 2015:

Overall (both funded and unfunded): 135

Funded: 95

Unfunded: 40

Region	Overall average	Funded average	Unfunded average
Jeanette Patterson	4.29	2.75	6.33
Pete Dring	7.70	7.70	Not run yet
Dave Ames	1.00	2.20	Not run yet
Mandi Banks	0.67	9.17	0.33
Carl Simmons	0.50	1.67	15.67
Stuart Davison	0.80	4.50	6.00
Dave Chaplain	1.00	1.67	Not run yet
Helena Gillespie	0.67	4.50	2.00
Dave White	0.67	4.67	6.33
Tarisai Chikomba	0.50	5.00	Not run yet
Trevor Bragg	1.00	3.70	Not run yet
Aidan Delaney	0.64	5.14	2.25
Phil Bagge	Not run yet	Not run yet	Not run yet

Steve Greenhough	0.60	3.11	9.33
Jason Budge	0.67	1.90	5.40
John Palmer	0.60	4.33	5.75
Pete Marshman	0.70	1.29	17.00
National average	**1.29**	**3.72**	**4.49**

APPENDIX Z

Example of other activities engaged in by one Master Teacher

Title	Type of Activity
Using ICT to teach data presentation at KS3 in a creative way to PGCE students	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.
Implementing KS3 computing in a cross curricular way	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.
How to incorporate computing specially for students with a range of special educational needs.	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.
How to incorporate the new computing curriculum to Learn Direct primary teachers	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.
Support in writing a SoW for KS3 students with special educational needs	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.
How Langley Grammar has implemented computing	Gave face-to-face, phone or email support to another teacher
Programming with assembler using Little Man Computer	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.
Incorporating computing in a kinaesthetic way in primary schools	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.
Support in writing a SoW for KS3 and learning how to program in Scratch	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.

Offering support at a meeting with ICT Primary Coordinators	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.
Incorporating the new computing curriculum in primary schools	Delivered training workshop with external organisation e.g. university, teaching school, commercial organisation etc.