Computer Science Accelerator Programme evaluation: Cohort 1
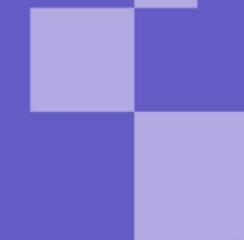
Research conducted by Rachel Dunford Consulting Ltd

October 2020

Rachel Dunford Consulting Ltd

Executive Summary

The Computer Science Accelerator (CSA) is a flexible professional development programme designed to give teachers the subject knowledge and confidence to teach GCSE computer science. The CSA is funded by the Department for Education, delivered by the National Centre for Computing Education and certified by British Computer Society, The Chartered Institute for IT. The programme enables teachers to gain the subject knowledge required to teach the GCSE curriculum with confidence and drive attainment in their school.

The CSA is impactful for schools, teachers and young people:

- Almost all graduates showed:

    - increased confidence to teach computer science.

    - increased computer science subject knowledge.

    - Increased enjoyment in teaching computer science.

- Over half of graduates stated there had been an increase in the number of students studying computer science at their school as a result of the programme

- More than a third said that there were now more computer science lessons being taught in their school.

- Over 80% saw a positive impact on their colleagues.

The CSA meets the needs of schools and teachers, providing high quality and effective support:

- 92% of graduates reported that the programme met their needs.

- Almost 97% of graduates found that the combination of online and face-to-face courses was an effective way to study.

- More than 80% said that the programme had been pitched at the right level.

- More than three quarters of CSA graduates voluntarily chose to undertake more than the minimum required hours of study before they took the final test at the end of the programme

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2

Contents

About Rachel Dunford Consulting

Rachel runs Rachel Dunford Consulting Ltd: an independent education consultancy. For nearly 20 years, she has provided support and advice to clients who work with children and young people. Rachel helps organisations to reach and maximise their engagement with disadvantaged communities and to measure the impact of their work. She has run research and evaluation projects across the public sector and has published reports for organisations such as The Royal Society, The Department for Education, the Wellcome Trust, and various Local Authorities. She is particularly adept at engaging new audiences, eliciting honest and open feedback and making strategic recommendations.

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Introduction

The Computer Science Accelerator (CSA) is a flexible professional development programme designed to give teachers the subject knowledge and confidence to teach GCSE computer science. It is suitable for current or aspiring teachers of GCSE computer science, and it offers support to teachers from all backgrounds.

The programme, delivered by the National Centre for Computing Education (NCCE), enables teachers to gain the subject knowledge required to teach the GCSE curriculum with confidence and drive attainment in their school. It provides a network of on and offline support to guide teachers through their professional development journey.

On successful completion of the programme, teachers obtain a professionally recognised training certificate, awarded by British Computer Society, The Chartered Institute for IT.

In May 2020, the NCCE commissioned an external evaluation to investigate the experiences of these graduates on the Computer Science Accelerator and to explore the impact that completing the programme had upon them, their students and their colleagues. This report presents the findings from the evaluation.

This report represents the first cohort of 283 graduates who completed the CSA programme between 15th January 2019 and 9th April 2019. Anyone who graduated after this point will be consulted in a second evaluation scheduled for the second half of the autumn term, 2020.

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4

Chapter 1: Headline findings

"It's been a long time since I have been able to access such CPD based on my subject specialism and I wish I could do more in the future."

KS3 computing coordinator

Among those people who participated in this evaluation, satisfaction levels in the Computer Science Accelerator programme were very high: 92% graduates reported that the programme delivered what they wanted it to. More than 98% graduates said that, as a result of completing the programme, their confidence to teach computer science increased, their computer science subject knowledge improved, and they now enjoyed computer science more.

"The face-to-face courses were brilliant, both in content as well as networking. The online courses are also great and enabled me to extend and widen my knowledge. The continued support from STEM mentors and online has been invaluable."

English teacher

Almost 97% people found that the combination of online and face-to-face courses was an effective way to study, and more than 80% said that the programme had been pitched at the right level.

Three quarters of those who used the diagnostic test at the start of the programme found that it was a useful tool to identify the gaps in their subject knowledge and to help them to choose the combination of courses they went on to complete.

More than three quarters of CSA graduates voluntarily chose to undertake more than the minimum required hours of study before they took the final test at the end of the programme. More than 6 in 10 graduates said that the final test was also useful in giving them an insight into any areas of their subject knowledge that they needed to improve.

"I was able to develop deeper subject and pedagogical understanding. I was able to build my confidence, develop my competence and quality for delivering without notes. My motivation has been increased and I have greater awareness of the areas I need to review. I have been able to update and further develop resources for the delivery of my subject. The potential to enhance my career progression and motivation to stay in the education profession has also increased."

Assistant subject leader, Computing

More than 8 in 10 graduates reported that their completion of the CSA programme had a positive impact on their colleagues. Over half said that, as a result of the programme, there had been an increase in the number of their students studying computer science, while more than a third said that there were now more computer science lessons being taught in their school.

> *"Before I took up my post last September there was no CS teacher as the previous incumbent left suddenly, so [after completing the CSA] the pupils now have a subject specialist. The uptake for GCSE is great for September, so [Computer Science in the school] is still improving. [The school] now have a head of subject who feels like a proper subject specialist and who is confident enough to take an active part in supporting other CS & ICT teachers across the academy trust as well as non-subject specialists at KS3."*

<div align="right">English teacher</div>

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6

Chapter 2: Sample and Methodology

In May 2020, the National Centre for Computing Education commissioned Rachel Dunford Consulting Ltd to conduct an external independent evaluation of the Computer Science Accelerator Programme. The evaluation comprised two distinct stages. The first stage consisted of an online survey which was distributed to the 283 graduates of the Computer Science Accelerator Programme. The survey included a series of quantitative and qualitative questions, enquiring about:

- graduates' basic identifying information;

- their satisfaction levels with the programme;

- details of their experiences at key points during the programme; and

- the impact that the programme had upon their own career, that of their colleagues, and on outcomes for their students.

A total of 62 people responded in full to the survey, representing a 22% completion rate.

Of the 62 people who completed the survey, 43 gave their permission to be contacted for the second stage of the project: telephone depth interviews. The interviews were designed to explore CSA graduates' experiences in more detail, going further than their survey answers and investigating the experiences of people with different starting points in greater depth.

In order to represent as broad a sample as possible, eight individuals were selected for interview (almost 13% of the total number of survey respondents). Four of those responded to the invitation and gave interviews to the project.

A full breakdown of the sample can be found in the Appendix.

Finally, case studies have been produced to document the experiences of two teachers who participated in the interview stage of the research. Both individuals did not teach computer science before they undertook the CSA programme, but found that it provided them with the skills, knowledge and confidence to apply for and secure full-time computer science posts upon graduation.

Chapter 3: Detailed findings from the survey and depth interviews

3.1: The survey cohort

The majority of the cohort of graduates who participated in this evaluation had experience of teaching ICT, computing or computer science before they started the CSA programme. Three quarters previously taught ICT at GCSE, just under three quarters previously taught computing at Key Stage 3, and just over six in ten respondents had previously taught computer science at GCSE.

Half of the survey respondents had been teaching these subjects for more than five years, and a further 40% had between two and five years of similar experience. Some 8% respondents had taught ICT, computing or computer science for between one and two years, with only two people saying that they had less than a year's experience.

Despite the cohort having experience of teaching computer science or related subjects, less than half of survey respondents (47%, n=29) would describe their subject knowledge of the computer science GCSE specification as being acceptable: i.e. that they were comfortable with *most* of the specification. Similar numbers of teachers (n=27, 43%) reported that their subject knowledge was only "average": they were only comfortable with *some* of the specification, suggesting that there was a clear need for the programme to improve teachers' subject knowledge.

Teachers' confidence to teach GCSE computer science before embarking on the programme was also divided: just over half of respondents (56%, n=35) said that they felt "quite confident" to teach it, but a third (34%, n=21) reported that they were "not very confident" about teaching it.

3.2 Motivations for undertaking the programme

The two biggest drivers for teachers completing the Computer Science Accelerator were their desires to increase and improve their overall computer science subject knowledge and to access pedagogical advice about how to deliver high quality, engaging computer science lessons. Some teachers (n=15) were keen to improve their knowledge of specific parts of the specification, such as python programming, algorithms and networks.

> *"I wanted to understand the parts of computer science that I wasn't very clear about. I wanted to be able to get clarity and understanding. The outcome of this would be improved teaching and learning and ultimately student progress whilst being more confident in answering my students' questions."*

Subject lead for maths and computing.

The next most cited motivation was that teachers wanted to be able to improve their confidence to teach computer science GCSE successfully. One teacher said:

> *"[I wanted to] increase my confidence in my ability to teach computer science. [I have] 20+ years' experience in IT, but as an analyst and as a project/programme manager. [My knowledge of] some aspects of curriculum was sketchy e.g. networks, and self-taught Python. [So, I wanted] increased confidence or just knowing I was doing the right thing to improve student outcomes."*

<div align="right">

Computer science subject leader

</div>

Other reasons for starting the programme included wanting to access ideas for better quality teaching resources (n=11), accessing strategies to support SEN and gifted and talented learners (n=4), helping them on a path to be able to teach A Level computer science (n=4), developing their career (n=3), improving their ability to assess their students (n=2), spotting errors and challenging misconceptions (n=2), getting access to subject experts (n=2) and supporting their colleagues (n=2). Six teachers also made specific reference to the fact that undertaking the programme would allow them to secure a formal qualification, and this was one of the reasons that they chose to do it.

One of those interviewed chose to do the programme in order to protect their job:

> *"Because I was an IT teacher, and it was my degree…when the government changed it to computer science, the choice I had was either to upskill or you have no job."*

<div align="right">

Maths and computer science subject leader

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Two interviewees said that they were well-supported by their senior leadership team (SLT) to undertake the programme, but explained that the financial support offered via the bursary scheme was instrumental in securing that support:

> *"There aren't an awful lot of courses that are free and that earn a bursary on top. So, to be able to go to the school and get permission for time out and pay for cover, that was a massive plus."*

<div align="right">

Head of department

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3.3 Beginning the programme

The Computer Science Accelerator Programme begins with an optional "diagnostic test" or subject knowledge quiz, designed to help teachers to assess their prior knowledge of the content of the GCSE computer science specification, and to enable them to select the courses within the programme that are most relevant to their learning needs.

The large majority of survey respondents completed the test (82%, n=51). Of those who completed it, three-quarters (75%, n= 38) felt that the diagnostic test had helped them to choose the courses they went on to study within the programme. Explaining their answers, teachers broadly either said that it indicated the gaps in their knowledge or that it confirmed what they felt were their areas of weakness.

> *"[Completing the test helped] me to see my weaknesses. I wanted to better understand those areas, to be able to deliver them to my students, and to help my colleagues too. When I realised what I didn't know, I knew I had to fix it."*

<div align="right">Computing teacher</div>

One interviewee described her experience of doing the initial test:

> *"[The test] was good. I was a bit nervous…to find out about 100 things I didn't know! We do it to children, but when we test ourselves, we want to get it all right…I wanted to get more knowledge. [The test] gave you a better understanding of what you needed to look at. The questions were very good…they got me thinking."*

<div align="right">Computing teacher</div>

The teachers who did not find the test useful gave a number of reasons to explain their answer. Five people said that they already knew which topics they needed to study and which courses they wanted to choose, two said that they chose to undertake all of the component courses on offer in order to expand their knowledge so the test results were not relevant in influencing their choice, one person said that they still took courses that they knew a little bit about, and one teacher reported that they:

> *"…got 100% in the diagnostic test - it was significantly easier than the final assessment, so [I] did have gaps which the diagnostic test didn't pick up".*

<div align="right">Computing teacher</div>

3.4 Course selection

Teachers responded well to the flexibility offered by the programme, both in terms of being able to choose the combination of topics to meet their needs and by combining face-to-face and online learning opportunities.

For this cohort of teachers, there was a stipulated minimum number of hours of study (40) required in order to qualify to complete the end of programme test. This equated to two face-to-face courses and two online courses. It was possible, however, for teachers to choose to do more than this if they wanted to. Over three-quarters of respondents (76%, n=47) reported that they voluntarily undertook more than the required 40 hours to complete the CSA Programme.

The most common number of courses that people chose to take was four (n=19, 31%), while a quarter of respondents (n=16) chose to take six courses. One teacher reported that they only did three courses, while two thirds of teachers (n=41, 66%) took more than four courses. Just under one in ten people (n=6, 10%) chose to do more than ten courses within the programme, with one person saying that they had done 16 and another completing 18!

One interviewee who chose to do 11 courses explained their decision by saying:

> *"Coming from the IT industry you are very aware that you need to keep current and up-to-date with your knowledge. CPD is critical and therefore it is a no-brainer to take advantage of the training on offer. Taking the courses meant I have learnt something new and I have seen better ways of conveying information to students. [It] also confirmed the things I was doing right."*

<div align="right">

Computing teacher (formerly DT teacher)

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Another teacher who selected six courses to study, reported that:

> *"…the information provided in many of the courses was invaluable to help me not only be confident to teach GCSE, but also to start preparing for A level for the future and also to help those pupils who are particularly bright and want to continue on to Key Stage 5 in computer science."*

<div align="right">

Computing teacher

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Teachers' course selections were grounded in their own personal and school circumstances, explaining why there was such variety in the number and combination of courses graduates chose. 42% respondents (n=26) chose to do the same number of online courses as face-to-face courses, while 45% respondents (n=28) chose to do more online courses than face-to-face courses, but only 8 respondents (13%) selected more face-to-face courses than online ones.

A teacher who did seven courses: five online and two face-to-face said:

> *"I am using time in lockdown to complete online CPD, to prepare me for teaching A Level next year. The face-to-face courses were chosen as it was during the holidays and [it was] practical based."*

<div align="right">

Computing teacher

</div>

The head of department interviewed chose to do all of the face-to-face courses on offer:

> *"I did them in quick succession over four or five days – I liked that way of learning, when you go somewhere, you get to talk to someone, and they can tell me where I didn't understand things. It gave me a really good grounding."*

<div align="right">

Head of department
</div>

Another teacher, who did nine courses: seven online and two face-to-face, said:

> *"I find it difficult to be released from school - luckily there were two face-to-face courses running outside of school hours. I chose more online courses because they can fit around me and the videos are very useful."*

<div align="right">

Computing teacher
</div>

And finally, a teacher who completed 15 courses, 13 of which were online, explained their choice by saying:

> *"[I chose] face-to-face [courses] for [my] areas of particular weakness, and online [courses] to boost [my] confidence and then purely out of interest and to get ideas on how to break topics down for [my] students and colleagues."*

<div align="right">

Computing teacher
</div>

3.5 Satisfaction with the Computer Science Accelerator Programme

> *"I felt it exceeded my expectations and complemented my classroom practice, which ultimately had a positive impact on my students' performance."*

<div align="right">

Computer science subject leader
</div>

3.5.1 Overall satisfaction levels

An overwhelming 92% respondents (n=57) said that the CSA programme delivered what they wanted it to. Teachers made a broad range of positive comments about the combination of course delivery methods, the content and quality of the resources and the knowledge and skills of the course facilitators, with one computing subject leader saying:

> *"The online courses were interesting and easily accessible. The face-to-face events allowed [us] quality time to devote to doing the work, whereas the online ones just had to fit around everyday activities. The materials and delivery of the courses was very good to excellent [sic]. In particular the knowledge and understanding of the teachers was strong and their classroom experience was invaluable."*

<div align="right">

Computing subject leader
</div>

Another subject leader reported that:

> *"…crucially the face-to-face courses gave me the time, away from the classroom, to do two important things: one - devote a chunk of time without interruption and distraction to working through content and skills. And, two - meet with other people and share ideas or discuss issues."*

<div align="right">

Computing subject leader

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A third subject leader found that the programme boosted their confidence to teach computer science:

> *"[The programme] increased my confidence. Most of what I knew and was doing was correct. [I got some] great ideas on how to improve [my] teaching in some areas, e.g. logic diagrams [which will lead to] better outcomes for my students. [There were] great networking opportunities on the face-to-face courses."*

<div align="right">

Computing subject leader

</div>

One of the interviewees described the significance of the CSA programme on her career:

> *"The programme did more [than deliver what I wanted it to]. It opened pathways, it got me a permanent contract in my school. [My school] showed a commitment to me and my subject. The NCCE was the driving force behind this: the amount of training and the resources you made available – you're the driving force."*

<div align="right">

Computing teacher

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In contrast to the large majority of opinion, just three people (5%) said that the programme had not delivered what they wanted, while the remaining two people (3%) were unsure. Those who were dissatisfied with the programme said that they had been disappointed by the face-to-face courses they had completed, with one subject leader reporting that,

> *"…there were five people on the course 'Algorithms' and I felt we simply touched the surface of this topic therefore I knew most of the content being delivered. The next course I attended was 'Networks' [and] I was the only person on the course and the delivery was very much focused on the resources provided. I felt it confused me rather than clarified networks."*

<div align="right">

Maths and computing subject leader

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A second computing subject leader commented that

"one of the face-to-face was really good, the other was a waste of my two days".

Computing subject leader

One interviewee (the computing and maths subject leader) talked further about her dissatisfaction with the programme, explaining that the logistics of the face-to-face courses had been disappointing (she was unhappy with the choice of venue and the parking arrangements) and that, despite there being low numbers on the courses she attended in person and this making her think she would have a greater chance to ask questions, she felt that the course facilitator did not answer her questions clearly or plainly, and that it felt awkward trying to ask again and again in order to get a response that helped her.

3.5.2 The level of the programme

More than eight in ten respondents (n=50, 81%) felt that the programme had been pitched at the right level, while eight people (13%) disagreed, and four (6%) were unsure. One very experienced computing subject leader commented that,

"It was a good mix of recap over existing knowledge, practical practice, and the introduction of new concepts and challenging tasks to push existing skills and knowledge."

Computing subject lead

A teacher who began the programme as the second in department for Design and Technology, but who went on to secure a computer science teaching post said in his interview that,

"…there was a range of content to test all levels. I appreciated this as the delivery was from CS teachers who could also share their experiences with lots of chance for discussion. [There was] also testing content to push the more experienced."

Computing teacher

One teacher agreed with the fact that there were people with varying levels of experience and knowledge on his course and that the CSA programme catered for them all:

"There were so many people of differing abilities: some did the course because [computer science] is something they can do and they already teach it, some had IT experience like me, and other people – there were ex-drama teachers thrown in at the deep end. We all complimented each other…it was really, really helpful. This was more evident in the face-to-face [courses]."

Head of IT department

There was a difference of opinion among those who did not feel the programme had been pitched appropriately, both with teachers saying that it was too basic and that it was too advanced.

One computing teacher reported that,

> *"…the algorithm course was top down – [it] felt as [if it was] written by and delivered at degree level down rather than for beginners upwards. I struggled to keep up with the pace required to get through all the resources during the face-to-face contact time - and had to go away and 'unpick' it for deeper understanding [and] to develop and deliver within [my] own teaching environment"*

<div align="right">

Computing teacher

</div>

In contrast, an A Level computer science teacher said,

> *"…the face-to-face materials - I think [were] pitched at someone who knew nothing about CS and the algorithms material may have been more suited to someone looking to teach it at primary school."*

<div align="right">

Computer science teacher

</div>

3.5.3 Quality of online versus face-to-face courses

More than six in ten people (n=40, 64%) said that they didn't perceive there to be any difference in quality between the courses they chose within the CSA Programme, but just over a third (n=21, 34%) said that they had experienced different standards of delivery.

Looking in more detail at their feedback, just two people were dissatisfied with their online courses, preferring to complete face-to-face sessions instead, *"as you could ask questions if you found anything difficult"* and which felt *"better organised"*.

Those who were unhappy with the face-to-face courses they completed commented on the quality of the resources and the facilitators. Eight people discussed the course facilitators, including one who said that,

> *"[the] delivery of one face-to-face course felt like they were just reading off slides and I could have completed it myself."*

<div align="right">

Computing teacher

</div>

Another teacher stated that they were…

"…not sure if some presenters knew any more than I did. Networks would be a good example. Also, [the facilitator] could be very theoretical, [and had] no ability to explain with real world examples."

<div align="right">Computer science teacher</div>

Four people made similar comments about course materials, with one computing subject leader commenting that:

"…at the beginning of the programme I think some resources had not been fully developed and those delivering were not fully confident with the content."

<div align="right">Computing subject lead</div>

A second computer science teacher said

"…some of the resources in the face-to-face courses, particularly those being delivered for the first time, [were] not well written, and had not been passed to the person delivering the course with time to improve".

<div align="right">Computer science teacher</div>

3.5.4 The combination of online and face-to-face studying options

The large majority of respondents (n=59, 95%) felt that the mix of online and face-to-face courses was effective. Of those people, more than six in ten (n=38, 64%) said that the combination was *very* effective. One computer science subject leader said:

"…some face-to-face is necessary. [It is a] bonus to meet other CS teachers. However, if all [of the programme were] face-to-face then [it would have been] difficult to get away from school that much. [The] online [courses] provided flexibility".

<div align="right">Computer science subject lead</div>

Another head of department agreed, saying that:

"If [the programme was] all face-to-face [it] would be too time bound, [there is] just not enough time during the school timetable to get released. But, [face-to-face is] great for networking. Online gives you greater control on when you undertake the course and you can work at own pace. The delivery of these courses has been very well thought out."

<div align="right">Head of computing</div>

3.6 The final test

At the end of the CSA programme, participants take a subject knowledge test in order to gain their qualification. Almost nine in ten (87%, n= 54) respondents said that their final test results were as they had expected them to be. Just five people (8%) did not get the results they expected, and three people (5%) were unsure. One computing curriculum lead said,

"I thought I would do better! I would like to think I would get 100% in the GCSE examination, but some questions were beyond the scope required (or slightly off the OCR syllabus)"

Computing curriculum lead

One of the interviewees described her experience in more detail:

"It felt a bit daunting, especially at my age [to take an exam]. But when I saw the questions, some of them were straight forward. But I quite liked that some were more challenging. It's not an easy breezy walk through – I really had to think. I passed on the second time. I was just below the pass mark the first time. What was good was that there was no way of looking back – of cheating – if you didn't know something, you had to study."

Computer science and maths lead

Almost two thirds of people (65 %, n=40) said that the final test results gave them insight into their own areas of improvement, but 27% (n=17) disagreed. Five people (8%) were unsure. An English teacher told us,

"I got 80% in the end, which was fine - but it is a continual journey and I clearly need to keep on improving my own knowledge as I teach so I could get 100% if I did it again!!"

English teacher

Among those people who chose to answer an optional question about how many times they needed to take the test to be able to pass it (n=58), the majority only needed to do it once to secure a pass (74%, n=43). Just over 20% respondents (n=12) had to take the test twice to pass, and three people (5%) took it 3 times.

Teachers had differing views about having to take the final test, with an English teacher saying that,

"It was interesting to see the areas I still had misconceptions about and also how the questions were asked. It is good to remember how it feels to be pressured by answering in timed conditions - so we can empathise with our pupils! The first time I took [the test], I got interrupted so couldn't finish, so that was a shame and made me nervous about retaking it."

English teacher

3.7 Programme impact

3.7.1 Impact on the graduates themselves

Graduates of the Computer Science Accelerator almost unanimously agreed that the programme had a positive impact on them.

98% of graduates (n=61) said that completing the CSA Programme improved their confidence to teach GCSE computer science. Within that group, almost three quarters (73% n=45) said that the programme had improved their confidence to a great extent. One respondent, who described their role before the programme as being a guidance team leader, said that as a result of the CSA Programme,

> *"I feel more qualified - and confident to introduce myself as a computer science teacher."*

<div align="right">

Computer science team leader, formerly guidance team leader

</div>

Only one person said that their confidence levels had not improved as a result of the programme.

The same number of respondents (n=61, 98%) said that their subject knowledge had increased as a result of the CSA Programme, with 62% of those people (n=38) reporting that their subject knowledge had increased by a great extent. A computing subject leader said,

> *"[Successfully completing the programme was] confirmation that I was approaching the delivery of the subject correctly and that I actually already had a good understanding of some areas of the curriculum."*

<div align="right">

Computing subject lead

</div>

Just one respondent wasn't sure if there had been any change to their subject knowledge levels.

Nearly all of the respondents (n=61, 98%) said that the CSA Programme had increased their enjoyment of computer science. And again, 42 of these people (69%) said that their enjoyment had increased by a great extent. Just one person reported no change to their enjoyment of computer science.

Graduates reported other benefits from having completed the programme and securing their qualification to teach GCSE computer science. One teacher who was new to the subject, told us,

> *"I feel more confident now that I have a qualification to support my own self-learning. There seems to be some stigma amongst some parts of the CS teaching community towards those of us without CS degrees (not real CS teachers). Having the qualification helps to feel more legitimate."*

<div align="right">

Computing teacher

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Just under 40% of graduates (n=24) commented that they benefitted from the range of networking opportunities that they accessed during the programme, both in terms of meeting other computer science teachers and in being able to work with the subject expert course tutors:

> *"The general support from the face-to-face networking and also the contact with STEM mentors and CAS members has been invaluable. I feel like I have become part of a community which is ongoing."*

<div align="right">English teacher</div>

Nine teachers commented on the value of the final qualification, referencing the importance of the…

> *"…certificate that shows my capability in this subject beyond just teaching experience and time. My PGCE and degree were not in computer science."*

<div align="right">Computing teacher</div>

A further 12 teachers commented specifically about how the programme had improved their confidence in teaching computer science, and three referenced the impact that the programme had on their career, with one teacher trainer (who was not previously teaching computer science) saying,

> *"I feel confident to deliver, and positive in knowing I can provide exceptional teaching resources. [It has given] me the confidence to apply for a computer science teaching job."*

<div align="right">Computer science teacher</div>

One interviewee talked about how the programme made a difference to his career:

> *"This year, because of going on the course, I have actually taken the top set year 9 computer science class. It's been a big learning curve – I've really enjoyed it. The difference in being in a DT environment versus having 32 students in front of a computer was initially very daunting – it felt a challenge. I'm looking forward to doing it again this year, and I'll be teaching A level computer science next year too."*

<div align="right">Computer science teacher (formerly DT teacher)</div>

3.7.2 Impact on graduates' colleagues

More than eight in ten teachers (82%, n= 51) said that there had also been a positive impact on their colleagues as a result of their completion of the CSA Programme.

One curriculum leader said:

"My colleagues have also signed up for this course. They are now more confident with many computer science principles, particularly programming".

<div align="right">Computing curriculum lead</div>

Another interviewee described his plans to mentor a colleague who would be starting the programme in the next academic year, using his own experience from the CSA Programme to support him, and explained that he would be helping out with some of the work of the Computing Hub which is hosted at his school – something he wouldn't have been able to do without having completed the programme.

Another classroom teacher has been able to add capacity to her department as a result of completing the programme:

"With one computer science specialist in my department of two teachers, the added flexibility of me being able to cover some GCSE classes is good. It may also lead to greater timetable flexibility if students choosing the subject increase in number."

<div align="right">Computing teacher</div>

An English teacher who has been able to change roles after completing the programme outlined the impact of her qualification on her school:

"I have supported non-subject specialists this year as well as other teachers across the Academy Trust. I hope the subject now has real credibility within the Academy."

<div align="right">English teacher</div>

3.7.3 Impact on students

More than a third of survey respondents (37%, n=23) said that the number of computer science lessons being taught in their school had increased as a result of their completion of the CSA Programme. One teacher, who switched roles from being guidance team leader to computer science teacher, said:

"I have been allowed to launch A-Level computer science and have taken GCSE from a brand new subject to one of the most popular GCSE options amongst students."

<div align="right">Computer science teacher (formerly guidance team leader)</div>

One head of department who participated in the interviews, described the benefits of being able to offer GCSE computer science to his students:

"Having [GCSE computer science] as an option – more than anything – if you take a child who wants to learn computer science and wants to become a programmer – if you teach

them a media course, it stifles them. So, having the other choice – helping them to learn to programme, can help the student to go to sixth form to do computer science there or at university – it starts them off at that road to higher education. In our school we have 50% pupil premium students - it is so important to have this opportunity for them. We can start to raise their aspirations early."

<div align="right">

Head of department
</div>

Significantly, however, more than half of respondents (53%, n=33) said that there were now more students doing computer science as a result of their completion of the programme, and this was manifesting itself in different ways. One subject leader explained that their school:

"…still has the same number of lessons, but [there] was never an issue with that. The number of students has increased as I've changed the structure of the courses at KS3 and I have greater knowledge and understanding to impart to them."

<div align="right">

Computing subject lead
</div>

Another head of department said that:

"…based on raising the profile of our subject we had been able to increase our contact time at KS3, to incorporate specific 'digital literacy' lessons for all students, freeing up other lesson time to delivery engaging and relevant units from computer science and IT."

<div align="right">

Head of department
</div>

An interviewee who secured a full-time computer science teaching post after completing the CSA programme described the improvements to her own teaching practice which would benefit her students in the future:

"Now when I plan units over the summer, they will be more robust. When you don't know something, it's very easy to put 500 slides in a PowerPoint and miss the point! Now, I know that I will be more efficient with my teaching, it will be more relevant, and I can include more analogies. I am going to stick with one thing and get them to learn it. Maybe [the CSA programme] has taught me that!"

<div align="right">

Computer science teacher
</div>

Chapter 4: Case studies

4.1 Annie Cuff-Davies: How CPD changed my career

Role: From guidance team leader to computer science teacher
School: Rutlish School, Merton

Why did you decide to do the Computer Science Accelerator?

I've been teaching ICT and computing for a few years now. I've taught key stage 3 and GCSE, but I was employed on a temporary contract at my school. I wanted to have the confidence to teach computer science at GCSE and to get myself a permanent contract, but I also wanted to be part of the new revolution in computer science, and to do projects to get everyone involved in it at key stage 4, so the Computer Science Accelerator programme was perfect for me. I had big aspirations!

What was it like getting started with the programme?

I completed the diagnostic test at the start of the programme - I was a bit nervous about finding out all of the things that I didn't know. We do this to children all the time, but when we test ourselves, we want to get it all right! But the test was fantastic – it got me thinking and it helped me see where the gaps in my subject knowledge were. When I realised what I didn't know, I wanted to fix it: I wanted to be able to deliver GCSE computer science to my students and to help my colleagues too.

I chose to do seven courses in total. I did more than I had to, because the courses were just outstanding. The combination of online and face-to-face courses was ideal. You need both to be able to cover a subject as broad as computer science.
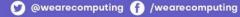
How did you find the courses that you chose to undertake?

The experience of doing the face-to-face courses was amazing. We were treated like royalty! The lecturers were so passionate about their subjects, and the resources they gave us were exceptionally brilliant. The sessions were pitched at exactly the right level. Everyone was catered for, whether you had plenty of computer science experience or none at all.

The online courses allowed me to study at my own pace. I could go back over topics as many times as I wanted, and I could ask questions if I needed to. Where there was content I was less confident about, I had the time to explore it in more detail.

The combination of courses that I picked worked really well and there were good links between them. The algorithm course helped me to understand the thinking behind some of the programming content, for example. The computer science GCSE specification is so big, and there is so much subject knowledge to learn, but there are links everywhere.

I took away so many ideas about how to make computer science tangible and relevant for my students, and ways to get them to use it to problem solve and to make them think.

At the end of the programme I sat the final test, and I passed. If I'd have taken it at the start, I wouldn't have been able to do any of it! The programme gave me a genuine opportunity to increase my knowledge, and it worked.

What has completing the programme done for you?

Completing the Computer Science Accelerator has honestly changed my career. It has given me the confidence to do so many new things. Since finishing it, I have been for interviews for computer science jobs, including a position in Munich teaching across primary and secondary free schools, which I got. But when I told my headteacher that I'd been offered the role overseas, she offered me a permanent contract to stay at Rutlish School! I was delighted - it wouldn't have been possible without the NCCE.

I'm now running lots of coding clubs in school and there has been such a great response. I use the clubs to engage my students in the huge range of potential careers computer science can offer. The students are all starting to see the value of computer science in different places, whether that's in making, building, gaming or problem-solving. They've said to me that they've found what they have learned with me useful in other subject areas too, and some students have told me that it's improving their focus at school. We have also seen a really big increase in the number of students wanting to study GCSE computer science, which is exciting.

How did the Computer Science Accelerator programme impact on your school?

The bursary has had a real, visible impact. We have been able to invest in our department, getting laptop computers for our students and robots for our coding clubs. We've also now got so many resources for our lessons that have come from all of the courses I took, which my colleagues are using now too.

I thought that the programme was going to be hard, but the support mechanisms were there all the way through. I didn't realise how much I would enjoy it, but it really changed my mode of thinking. It was exciting, and genuinely engaging.

I can't wait to be able to have my own GCSE computer science class, and I want to support other schools with their key stage 4 teaching too. It has been a fantastic journey!

4.2 Nigel Ferry: From design to digital technology

Role: Computer science teacher
School: Cardinal Hume Catholic School

What made you choose to teach computing?

I didn't have any direct experience of teaching computer science, but I come from an industry background where I worked for a company that made electronic circuits for automating CNC machines, so I've always been interested in it.

I've been teaching design and technology for ten years, but when I saw that the specification for GCSE computer science had changed, I thought it was the perfect time for me to crossover from DT to computer science. It's such a valuable subject and I was conscious that there is a shortage of teachers with the right skills, knowledge and experience to teach it.

How did you find out about the Computer Science Accelerator programme?

I'm very lucky because my school is a Computing Hub, so it is easy for me to access excellent training. My senior leadership team are very supportive and encouraged me and another colleague to enrol on the programme at the same time, so we ended up completing the programme together.

How did you find the start of the programme?

I completed the diagnostic test and went to speak to my head of department (I am now a computer science teacher!) We looked at the courses on offer together and decided which ones would be the best fit. I ended up doing 11 courses, 9 of which were online – way more than the required amount – because I loved doing them! Changing my career and making the leap from DT was such a huge decision and I really wanted to be the best CS teacher I could be.

What was the combination of online and face-to-face training like?

The online courses were excellent and were easy to fit around my family and work life. The resources, and the way that the information was presented and described – it was all tremendous! I chose the face-to-face courses to plug the gaps in my knowledge and I would have done more of them, had it not been for Covid-19.

The programme gave me a good breadth of knowledge and it was pitched well. I was on face-to-face courses with lots of people who were already teaching computer science, but there was something for all of us. It was really useful to hear about the issues existing teachers were having and discussing how to

overcome them together, but equally it was good to work alongside teachers who had no prior understanding of computer science. We all got a good grounding in the subject and there was a range of content to test all levels as well as plenty of opportunities for discussion.

How did you find the final test at the end of the programme?

I had a few things going on at the time of the final test and I didn't have as much time to revise as I might have liked, so I felt like it was going to be an honest appraisal of how much I had learned. It was excellent, really rigorous. It covered a lot of content and there were lots of different sorts of questions to really challenge you. But it felt like a fair test and I did pretty well!

How has the programme made a difference to your career?

I had thought I was going to take my time, making the move from DT to computer science, but a vacancy came up and I made the decision to just risk it. And, as a result of the programme, I am now a computer science teacher! This year, because I was completing the course, I was given a top set year 9 class and I'll be taking on GCSE classes next year. It felt a bit daunting to begin with – it's quite a change from being in a DT environment, but the programme has given me the confidence to realise the skills that I have.

And, combining this new knowledge with my experience in industry, I feel like I can offer a lot to my students. I'm now starting to explore A level content. I know that it is a big jump, but I've got the confidence to do it, and I'm really motivated now!

Has there been any impact on the rest of your school?

As for my students, my year 9s have really benefitted. I now have a whole load of new strategies about how to tackle certain elements of the curriculum, and a better understanding of the things that students struggle with.

We have also had a lot of discussion in the staff room about the CS Accelerator programme and I have a number of colleagues who are interested in taking it next year. I'm going to be mentoring a student teacher next term and my new knowledge is definitely going to come in helpful with that. I have added significant capacity to our department, so my head of department is able to focus on the Computing Hub more, but he's also been impressed with my understanding and knowledge of computer science, so hopefully I will have the opportunity to get involved with that too!

Appendix: Detailed Sample and Methodology

Survey Respondents

Looking more closely at the full set of survey respondents:

- Half (n= 31) had more than five years of experience of teaching computing, ICT or computer science, a further 39% (n=24) had between two and five years of teaching experience, while only 8% (n=5) had between one and two years' experience and just two people had taught it for less than one year.

- Before they began the programme, 47% respondents (n=29) described their subject knowledge of the computer science GCSE specification as being acceptable (they were comfortable with most elements of it) and 44% (n=27) said that their knowledge was average (they were comfortable with some of the specification). Five people described their subject knowledge as being very good, while two people said it was poor.

- More than half of the respondents (56%, n=35) felt quite confident about teaching computer science GCSE before they started the programme, while a third (n=21, 34%) said that they were not very confident to teach it. Among the remaining respondents, five said they were very confident, and one said they were not at all confident.

- Just over a quarter of respondents (26%, n=16) began the Computer Science Accelerator as computer science, ICT or computing teachers, while 61% (n=38) started it as heads of department or subject leads for computing, ICT or computer science. Two people described themselves as the second in the computing/computer science department, while the remaining 7 people had teaching roles in other departments not related to computing.

Interview Respondents

The four interview respondents represent:

- One person with less than a year's experience of teaching computing, ICT or computer science

- One person with between two and five years of experience of teaching computing, ICT or computer science

- Two people with more than five years of experience of teaching computing, ICT or computer science

- One computing subject teacher

- One head of department for computing/computer science

- One maths and computing subject leader

- One teacher who began the programme as the second in department for design and technology, who went on to become a computer science teacher on completion of the programme

Of the interview sample:

- One said that they began the programme only comfortable with some elements of the computer science GCSE specification while the other three said that they were fairly comfortable with most of it

- Two said that they began the programme quite confident to be able to teach GCSE computer science, while the other two said they were not very confident about teaching it

- Three people said that the programme had delivered what they had hoped it would, while the fourth person said the programme had not met their expectations

- Three people felt that the programme had been pitched at the right level, while the fourth person did not

- All four people said that their subject knowledge and their confidence to teach computer science had improved to a great extent as a result of completing the CSA programme

- Three people reported that their enjoyment of computer science had improved to a great extent after doing the CSA programme, while the fourth person reported "some" improvement in their enjoyment of the subject.