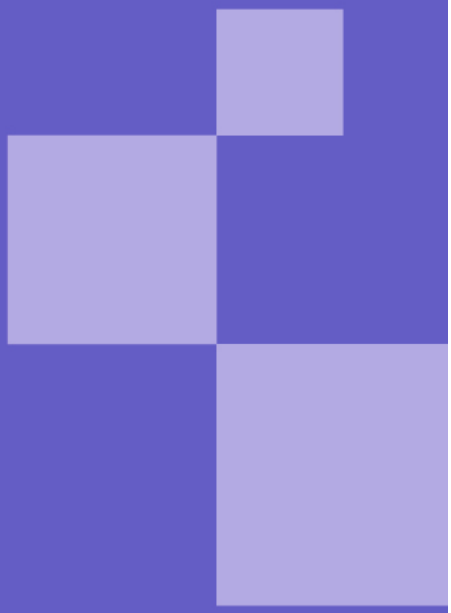
National Centre for Computing Education

Computer Science Accelerator Programme evaluation: Cohort 2

Research conducted by Rachel Dunford Consulting Ltd

July 2021



Rachel Dunford Consulting Ltd

National Centre for Computing Education

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. It is funded by the Department for Education, delivered by the National Centre for Computing Education (NCCE) and certified by BCS, 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 teachers, schools and young people

- Over 90% of CSA graduates stated that the programme had improved their computer science subject knowledge and their confidence to be able to teach GCSE computer science.
- 88% reported increased enjoyment in computer science having completed the programme.
- More than half saw a positive impact on their colleagues.
- A fifth of graduates said that there had been an increase in the number of students studying computer science as a result of the programme. The same number stated that there were now more computer science lessons being taught in their school.

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

- 90% of graduates said that the programme met their needs, with 87% reporting that it was pitched at the appropriate level.
- 92% felt that the combination of face-to-face and online courses was an effective way to study.
- More than 80% of 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.
- Almost two thirds reported that the final test gave them an insight into areas for future CSA engagement, helping them to improve further.

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1. 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 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 online 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 BCS, The Chartered Institute for IT.

In October 2020, the National Centre for Computing Education commissioned an external evaluation to investigate the experiences of the second cohort of graduates to graduate from 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.

The second cohort of 1076 participants completed the CSA programme between 16 April 2020 and 12 October 2020.

Research conducted by Rachel Dunford Consulting Ltd - May 2021

2. Headline findings

Nine in ten respondents (91%, n=83) said that the CSA programme had improved their confidence to be able to teach GCSE computer science. Even more respondents (95%, n=86) said that the programme had increased their computer science subject knowledge and 88% (n=80) reported that they enjoyed computer science more, having completed the programme.

> *"I learned a lot and connected with quite a few colleagues. It led me to have the confidence to apply for the job I have now in an independent selective school".*
>
> Computing teacher

Nine in ten cohort two graduates who participated in this evaluation said that the Computer Science Accelerator Programme delivered what they wanted it to (90%, n=82). Almost nine in ten (87%, n=79) felt that the programme had been pitched at the appropriate level, and just over nine in ten (92%, n=84) felt that the combination of face-to-face and online courses was effective.

> *"I came away significantly more confident than when I arrived, with a number of new ideas and some good contacts."*
>
> Trainee teacher

82% of cohort two CSA graduates (n=75) voluntarily chose to undertake more than the minimum required hours of study before they took the final test at the end of the programme. 65% of respondents (n=59) 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.

More than half of respondents (53%, n=51) reported that their completion of the CSA programme had a positive impact on their colleagues.

> *"It provided me with a whole range of resources and contacts. I have encouraged many others to do the same and I really wish this programme would stay around for longer as it creates a great community."*
>
> Trainee teacher

A fifth of graduates (22%, n=20) said that, because of the programme, there had been an increase in the number of their students studying computer science and that there were now more computer science lessons being taught in their school.

"To have endorsement for teaching computer science at GCSE has allowed me to open up further opportunities to work with NCCE as well as to increase our 7-9 GCSE grades within a grammar school setting"

Head of Computer Science

3. Methodology

In October 2020, the National Centre for Computing Education commissioned Rachel Dunford Consulting Ltd to conduct an external independent evaluation of the second cohort of graduates from the Computer Science Accelerator Programme ('Cohort 2'). The evaluation comprised two stages.

The first stage consisted of an online survey which was distributed to the 1076 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
- the impact that the programme had upon their own career, that of their colleagues, and on outcomes for their students.

The survey was as close as possible in content to the one previously used with the first cohort of graduates in the summer of 2020 ('Cohort 1'), to allow for as close a comparison of their experiences as possible. However, one additional section was added to the Cohort 2 survey to explore whether and how graduates had made use of the CSA Programme handbook. The handbook was only published after the study period for Cohort 1.

A total of 91 people responded in full to the Cohort 2 survey. Of the 91 people who completed the survey, just under half of the respondents (n=42) gave their permission to be contacted for the second stage of the project.

The second stage involved a set of 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.

A sample of individuals were invited for interview, of whom six took up the opportunity. This group comprised three people who began the programme with a computing teaching background and three people who were new to computer science. Four of the interviewees were teaching in state secondary schools, the fifth had a teaching role in an independent secondary school and the sixth person was a trainee teacher at the time of completing the programme, but has since gone on to accept a teaching role in another subject.

Three interviewees had given permission in their survey responses for their information to be written up as a case study, which can be found in the final chapter of this report.

The data captured via the survey and the depth interviews has been combined to form the basis of this report. In addition, at the end of each section, comparisons have been drawn between the responses provided by Cohort 1 and Cohort 2 to examine any differences in their experiences.

4. Detailed findings from the survey and depth interviews

4.1. The survey cohort

The survey of Cohort 2 graduates was completed in full by 91 individuals.

More than nine in ten respondents (91%, n=83) were working in a school at the time that they undertook the CSA programme. The remaining respondents comprised four trainee teachers, two FE lecturers, one STEM and computing consultant and one person was a trainer of programmers within industry but was an ex-teacher.

Of those who were teaching in a school at the time of undertaking the CSA programme, the large majority (94%, n=78) were working in a state secondary school. The other respondents were made up of two teachers from independent schools, one FE college lecturer, one middle school teacher and one primary teacher.

Almost two-thirds of respondents reported that computing was their first subject (64%, n=58). Four respondents said that their first subject was not computing, but it was ICT. The remaining third were made up of teachers of maths (n=6), science (n=6), business studies (n=5), PE (n=3), geography (n=2), RE (n=2), English (n=1), media studies (n=1) and music (n=1).

In contrast to the Cohort 1 survey, in which 100% of respondents reported some experience of teaching computing, ICT or computer science before they began the CSA programme (it was a prerequisite to completing the course at that point), the equivalent figure for Cohort 2 was just 57% (n=52). This means that more than one in four of Cohort 2 graduates (43%, n=39) said that they had no relevant teaching experience, despite some of those people claiming computing as their first subject.

Looking at the relevant experience of those who had taught a related subject before the CSA programme more closely:

- 49% had previously taught computing at KS3 (n=45)
- 46% had previously taught ICT at KS3 (n=42)
- 36% had previously taught computing at GCSE (n=33)
- 43% had previously taught ICT at GCSE (n=39)
- 43% had previously taught computer science at GCSE (n=39)

Notably, 29% respondents (n=26) had prior experience of teaching all of the following subjects before they started the CSA: ICT at KS3; ICT at GCSE; computing at KS3; computing at GCSE and computer science at GCSE.

Among the people with prior experience of teaching computing, ICT or computer science, 36 individuals had taught it for more than five years. Ten people had between two and five years of experience teaching those subjects, three people had taught them for between one and two years, and another three people had taught them for less than one year.

Just under a fifth of respondents (19%, n=17) said that they felt very confident to teach GCSE computer science before they began the CSA programme. A further 41% (n=37) described themselves as quite confident. The remaining 40% were either not very confident (34%, n=31) or not at all confident (6%, n=6). These confidence levels tally with the data on prior teaching experience.

4.1.1. Compared with Cohort 1…

Cohort 1 was restricted to teachers of computer science who were teaching in state secondary schools. The CSA programme was then expanded to include teachers from state-funded FE colleges, primary and middle schools, people who were not currently teaching computing or computer science but who wanted to retrain and teach an additional subject, trainee and supply teachers, and teachers who were returning to the classroom to teach computer science.

As a result, Cohort 1 had noticeably more relevant teaching experience than their Cohort 2 peers:

	Cohort 1	Cohort 2
ICT at GCSE	76%	46%
Computing at KS3	74%	49%
Computer science at GCSE	63%	43%

Despite this difference, confidence levels were similar between the two cohorts. 60% of Cohort 2 said that they were confident about teaching GCSE computer science, compared with 64% of Cohort 1.

4.2. Motivations for completing the programme

The most common reasons that Cohort 2 respondents provided for having chosen to complete the CSA programme were to increase their computer science subject knowledge (n=52) and to increase their confidence to teach it (n=33).

"[I wanted] additional confidence in the subject, particularly in being responsible for teaching exam-year groups for the first time. [I] had only previously the much-disrupted training experience of last year and was not particularly confident in delivering the content, despite a good level of subject knowledge. My aim in coming to the programme was to build confidence in techniques and strategies for teaching computer science at GCSE. I wanted to get advice and watch the work of leading experts and practitioners, as well as gain a better understanding of the overall feel of the course as well as the pitfalls for most students."

Trainee teacher

14 people said that they wanted to increase their pedagogical knowledge and to learn new approaches to teaching computer science, while another 12 people specifically needed to complete the programme to start to offer it at GCSE.

One teacher, whose main subject was religious studies, said he had:

"…a good knowledge of computing and coding and had previously taught KS3 groups computing. I wanted something that gave me the skills to feel confident teaching this subject to GCSE as it is different to RS and would be useful CPD"

Religious studies teacher

Ten people were interested in gaining a recognised qualification to demonstrate their ability to offer GCSE computer science or to support them in their subject leadership roles.

4.3. The diagnostic test

The CSA programme begins with a diagnostic test which enables participants to determine where the gaps in their subject knowledge may be, to help to guide them in their choice of courses. The large majority of Cohort 2 graduates (84%, n=76) completed the diagnostic test, and just over half of these people (53%, n=40) said that it helped them to choose which courses to study.

"After completing the diagnostic test, I was directed to the courses that would be most beneficial for me and my development. The test was able to identify where my weaknesses lie in terms of my subject knowledge."

Head of Computing

There was no obvious connection between the level of confidence a teacher had about teaching computer science and their perception of the usefulness of the diagnostic. Of those who found it useful, 45% (n=18) were not confident about teaching computer science before they began the programme, two of whom (5%) said they were not at all confident. 50% (n=20) said that they were quite confident about teaching computer science, while the remaining 5% (n=2) were very confident about teaching it before starting the training.

There were several reasons explaining why some people felt that the test did not add anything for them. In some instances, it was because they already knew what their weaknesses were and knew which courses they would need to complete to address them. One teacher said that they got almost everything right in the diagnostic test, but that they knew that their own weaknesses lay in their pedagogical knowledge, as opposed to their subject knowledge. They were keen to complete the programme to expand their range of teaching strategies to impart that subject knowledge to their students. Another teacher felt that the diagnostic test just:

"…picked some random topics: I did well on the test".

Lead practitioner, physics

4.3.1. Compared with Cohort 1…

Slightly more of Cohort 2 used the diagnostic test but, among those who did, fewer people found it useful than the Cohort 1 users of the same test.

4.4. Course selection

Cohort 1 students were required to complete a minimum of 40 hours of CPD to be eligible to take the end of programme test. This requirement was removed for Cohort 2 participants, who instead needed to complete a minimum of 10 hours of CPD – including just one face-to-face CPD course.

Cohort 2 graduates reported that they completed between 1 and 40 courses within the programme. The most common number of courses completed by cohort two graduates was four (n=26). Around a fifth of respondents (20%, n=18) said that they did fewer than four courses and just under 10% respondents (9%, n=8) completed more than ten courses. The individual who did 40 courses completed 37 of these online and 3 face-to-face.

More than eight out of ten Cohort 2 graduates (82%, n=75) chose to do more than the minimum requirement of 10 hours of training. The rules stated that they must also complete a minimum of one face-to-face course. Nearly half of Cohort 2 graduates (47%, n=43) chose to do more than one face-to-face course, while 18% (n=16) chose to complete more than two face-to-face courses (which was the required minimum for Cohort 1).

Many respondents reported that they were able to exceed the minimum number of courses because they found themselves with more time, thanks to the national lockdown during the pandemic and the closure of face-to-face schooling for most students:

"I had lots of non-contact time due to lockdown, so I decided to use the time for this. It was useful to be a remote learner to have an idea of what helped my students learn."

Computing teacher

The FE lecturer who completed 40 courses simply explained their decision to do so by answering:

"Covid!"

One teacher explained that they did not feel that completing the minimum number of courses would have equipped them with sufficient knowledge to pass the summative test at the end of the programme:

"I didn't feel the bare minimum covered enough to pass the final test. The topics covered were much broader than what I did on the original two online courses. I don't think you can pass without doing extra courses or having prior knowledge."

Maths teacher

One of the interviewees did not feel that the volume of study she had completed was sufficient for her to feel confident to teach GCSE computer science, even though she exceeded the minimum number of hours:

"I did about 40 hours' contact time…but I don't feel that truthfully I could teach GCSE computing in school. It would take me a lot more to do that. I feel that I need the KS3 knowledge too – what the kids are going into GCSE with. In fact, if I look at the KS2 computer science curriculum, there are things in there that I don't necessarily know – I have no formal IT training."

Trainee maths teacher

Another teacher chose to do more courses purely because of their enjoyment of the subject:

"I love learning about computer science! I can program but there are the intricacies of the theory that fascinate me - I like being able to join the dots between why we program the way we do and the theory."

Computer science teacher

The survey asked respondents to note the number of face-to-face and online courses they completed. However, due to the Covid-19 lockdown, the majority of face-to-face courses had to quickly pivot to being delivered remotely – i.e. by a live facilitator using online technology (as opposed to the online courses which were always hosted by the FutureLearn platform and which participants completed in their own time and at their own pace). The results of this question have therefore been interpreted to assume that the respondents are categorising any courses that they completed either face-to-face or remotely as face-to-face.

"I actually did the remote learning (but they were effectively the face-to-face sessions whilst lockdown restrictions were in place). I chose topics I was interested in. I loved the fact so many courses could be done remotely as otherwise I would struggle to attend in person."

Computer science teacher

A fifth of participants (21%, n=19) completed the same number of online courses as face-to-face ones. More than six in ten people chose to do more online courses than face-to-face, while just over one in ten did the reverse[1].

A few respondents commented on the fact that, were it not for lockdown, and the move from face-to-face to remote delivery, they would not have been able to participate in and complete the CSA programme:

"We went into lockdown and we did everything online, all remotely. It didn't affect any of my school time – I did it all in the Easter, May and summer holidays. Had I been at school and taken time off, it wouldn't have been so easy"

Head of Computing

"Because we were not at work, I wasn't taking any time off. We weren't doing live lessons in our school [during the pandemic], so I was able to fit the programme around my studies. Saying that though, I wouldn't have had the mental bandwidth to do it if I was in school."

Business studies and economics teacher

4.4.1 Compared with Cohort 1…

More of Cohort 2 chose to do more than the minimum required hours than their Cohort 1 peers (82% vs 76% respectively).

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1. N.B A number of respondents gave a response to this question that contradicted their previous answers, and have therefore been discounted. The percentages for this survey question do not therefore total 100.

4.5. Overall programme satisfaction

Nine in ten Cohort 2 graduates (n=82) said that the CSA programme delivered what they wanted it to. 35 people commented on how much the programme had increased their computer science subject knowledge, 15 people noted the improvement in their confidence to teach the subject and 13 people remarked that they came away with new ideas and pedagogical knowledge.

"It helped me understand the course better and the course content, as well as giving ideas for learning resources and learning activities I could use."

Head of RE

Some participants commented on the high quality of the programme and the opportunities to connect with their peers during their studies:

"The tutor-led courses were very informative and working with others and communicating as a group made it feel like you were in a room together"

ICT teacher

"It certainly helped me pick up new knowledge and revise things I hadn't studied in years. It gave me the opportunity to discuss with other teachers in the forums and see their answers. I also discovered some interesting resources. I found the delivery quite good and engaging and I will be continuing with some courses I started but didn't manage to finish because of my SKE and PGCE."

Network Manager, primary school

Only two respondents felt that the programme fell short of their expectations. One teacher was disappointed by the quality of the delivery and the content within the face-to-face sessions and the pace of the online courses, saying that it was too fast on the harder topics and too slow for the simpler concepts. The second person felt that the course was more aimed at people who were already teaching GCSE computer science than those who were new to it. They felt that information about pre-requisites for the course was unclear and, in some places, misleading.

Almost nine in ten Cohort 2 graduates (87%, n=79) said that the programme was pitched at the appropriate level for their learning needs:

"[It was] just right. Challenging at times but you gotta [sic] stretch in order to grow"

NQT computer science teacher

"[The] courses were good for a mix of people, as [they] covered basics to answering more complex questions."

Computing teacher

One teacher was happy with the level of the programme for her, but was unsure as to how accessible it would be for a total beginner:

> *"…for me, yes [it was pitched at the right level]. I have been teaching [computer science] for a while. As a brand new teacher, some of it may have been too much. I am familiar with the language, the words, the software…which made it more enjoyable and I could really engage with the learning. As a new teacher, though, I could have been daunted especially if I had no prior computer science knowledge."*
>
> Head of Computing

Of the three people who did not agree that the course was pitched appropriately, one participant - who reported that every element of the programme that he participated in was outstanding - felt that if you already had some, or a lot of, subject knowledge, then there were fewer opportunities to expand on what you were learning. In contrast, a second teacher said that they felt that some of the content knowledge was pitched higher than the GCSE level that they were already teaching. The third person said that they had to do a lot of additional study themselves in their own time to be able to follow and keep up with the programme.

4.5.1. Compared with Cohort 1…

Overall satisfaction levels were similar between both cohorts: 90% of Cohort 2 graduates and 92% of Cohort 1 graduates said the programme delivered what they wanted.

Cohort 2 graduates were happier with the level of the programme content than their Cohort 1 peers: more of them said it was pitched at the right level (87% vs 81% respectively).

4.6. Course quality

Nearly seven in ten Cohort 2 graduates (68%, n=62) said that they did not experience any difference in quality between the courses they completed.

As seen in the earlier question about overall satisfaction levels, many respondents noted that all the courses that they completed were of a high standard:

> *"All of the courses I did were really high quality: I was really impressed. They had chosen well-selected individuals to lead the units"*
>
> Head of Computing

> *"The courses were all of an excellent standard and I learnt a lot."*
>
> Computer science teacher

One participant welcomed the variety of approaches used by the course leaders:

> *"All the courses I have completed were very good. They had diverse ways to present the information (video, text, picture), quizzes to check your understanding of the new terms, and interesting practical activities."*

After-school club volunteer

Where people did have comments to make about quality, they tended to centre around initial technical difficulties relating to the delivery of remote learning courses, but the comments were contextualised with an acknowledgement of the speed at which the courses had to change delivery formats during lockdown:

> *"[There was only an issue with the quality of the remote course] because the face-to-face was the first one moved online so it felt as though it was unusual for the presenter"*

Head of Computing

More than nine in ten graduates (92%, n=84) felt that the combination of face-to-face and online courses was effective, of whom more than half (n=45) felt that this combination was very effective.

> *"The face-to-face [courses] were more interactive but the online [courses] were convenient"*

Head of IT

> *"The combination of face-to-face and online training worked well for me. For some of the courses, you don't need so much hand-holding – you can read it at your own pace. There were lots of activities online with STEM Learning. For example, in the networking course I didn't need a face-to-face or remote session – the reading and activities are online. You can talk to so many other people – they have a chat function – you can talk to people all over the world – it's global networking! It was nice to see their views and how they got on with [the course] and their answers."*

Head of Computing

As already discussed, the opportunity to complete the courses that had initially been scheduled as face-to-face via remote learning opened up the programme to many more teachers, as this method of delivery removed their need to travel to attend any of the sessions:

> *"We were in lockdown when I started [the CSA programme]. During that period, I had more time than I usually do. I love studying in my own time, and I really enjoyed it. I could sign up to as many courses as I wanted – they were online and easily accessible. The courses were very content-based, and I could translate them straight into my classroom teaching and knowledge."*

RE teacher

Equally, however, many people said that if they could have chosen, and had travel and permission to have time out of school not been a barrier, they would have preferred face-to-face delivery, as it provides more immediate opportunities to ask questions.

> *"The ability to work at your own pace is great, but the blended approach is so much better, having the immediacy of face-to-face and direct peer support."*
>
> Head of Media Studies

Several teachers commented on the fact that the remote courses, despite being run by a presenter, lacked any real feedback mechanisms:

"During the remote courses, when you are doing some of the booklet, no-one checks those answers. If it had been run in a school setting, the course leader would be checking them and then offer feedback and check for your understanding. You did get set tasks, but there was no feedback loop. I missed the problem solving and the discussion opportunities [that you get in face-to-face training]."

Head of Computing

Through the established standards that are reinforced through the quality assurance process, facilitators are expected to support formative assessment and to adapt CPD - this includes the use of gap tasks. They are also asked to be available to support participants in online communities related to CPD. Gap tasks are designed to be highly collaborative, however, and facilitators encourage participant review and interaction, with peer-feedback, as well as formal assessment and facilitator feedback.

4.6.1. Compared with Cohort 1…

Slightly more of Cohort 2 reported that they did not perceive any difference in quality between the courses they completed (68% vs 64% respectively). Notably, however, considerably more of Cohort 2 felt that the combination of face-to-face and online courses was effective (92% vs 61% respectively), perhaps as a result of the move to remote learning for many of the courses.

4.7. The CSA Programme Handbook

The CSA programme handbook is a resource available for CSA participants which contains an overview of the knowledge required to teach GCSE computer science, links to relevant CPD, resources and self-study material, and details of support available to help people to gain the NCCE Certificate in GCSE Computer Science Subject Knowledge. The CSA programme handbook was not available for Cohort 1, and so only those people in Cohort 2 were asked questions about it.

Just 20% of graduates (n=18) were aware of the CSA handbook, and only 12% of graduates (n=11) reported that they had downloaded it. Of those people, four downloaded it when they registered for the programme, four accessed it during or after their first face-to-face course, one accessed it after their first online course, and two people accessed it after completing the programme.

Most of these people said that they used the handbook for reference purposes, with one person saying that it would be a useful source of information for the future too. One person used it solely to look at the assessment sections and another referred to it to check for any other gaps in their subject knowledge.

To improve awareness of the handbook a link has been added to the welcome email which participants receive on sign-up to the programme.

4.7.1. Compared with Cohort 1…

The CSA programme handbook was not available for Cohort 1, so no comparison is possible.

4.8. The CSA programme summative test

More than eight in ten graduates (82%, n=75) said that the final test gave them the results that they expected it to. Cohort 2 graduates took the test between one and six times to secure a pass.

> *"I found the final test great it brought together much of what I had learned over the course of the sessions"*
>
> FE college lecturer

For those people who did not get the results that they expected to, three were disappointed that they had not done better (one person expected to get 100%, but was surprised to achieve in the 90s), and two were surprised that they had done so well.

There were six people who, in answer to this and the next question, complained about the wording of the questions within the summative test, suggesting that in places there were more than one answer that could have been deemed to be correct:

> *"Far too many questions had multiple answers that could be argued as correct. In many respects it felt like I was losing marks because I had incorrectly guessed as to which of the correct answers was in the mind of the person setting the questions. I still passed first time, but only got 76%. That may sound churlish, but there was only one question where I was unsure of the answer and half a dozen more where I had to effectively toss a coin to decide between two answers which would both get credit on a GCSE exam."*
>
> Head of Computing

Almost two-thirds of graduates (65%, n=59) said that the test gave them an insight into their areas of improvement.

> *"It helped me see in which areas I still need to do online courses - which I fully intend to do. I enjoy them and feel a sense of satisfaction, as well as gaining a better understanding of what I am teaching. They are also free and flexible - quite unlike the courses I am used to occasionally doing in RE and Philosophy (and PSHE, previously)."*
>
> Physics teacher

> *"[It] showed there were areas I still needed to improve on, but these were areas not covered by the courses I had taken."*
>
> Computing and IT faculty leader

Five people complained that the questions were worded badly/confusingly and that it wasn't a question of their lack of knowledge, but of misleading questions where multiple answers could have been correct or badly worded questions. One person said that the test was pitched at the wrong level and was much more suited to A Level content than GCSE.

Seven people said the results were as they expected them to be, so they didn't get any new insights from doing the test.

Three people said that they found the final test feedback difficult to interpret, and another said that their results told them that their areas for improvement did not tally with the questions that they had got wrong.

And finally, one person said that they got the same score for the diagnostic test at the start as they did in the final test.

The performance of questions in the test is reviewed regularly using statistical data and scrutiny by expert computing teachers. Questions that perform anonymously are removed.

4.8.1. Compared with Cohort 1…

Slightly fewer Cohort 2 graduates reported that the final test gave them the results they expected than those in Cohort 1 (82% vs 87% respectively). The same proportion in both cohorts said it gave them an insight into where they had improved.

In both cohorts, the majority only took the final test once to pass it (70% for Cohort 2 vs 74% for Cohort 1).

5. The impact of the CSA programme

5.1. On programme graduates

A significant majority of Cohort 2 graduates reported improvements to their confidence to teach computer science, their subject knowledge, and their enjoyment of the subject.

Nine in ten people (91%, n=83) said that the CSA programme improved their confidence to teach GCSE computer science. Almost six in ten people (59%, n=54) said that it had improved their confidence to a great extent.

More than nine in ten people (95%, n=86) saw an increase in their computer science subject knowledge having completed the programme, and more than half (55%, n=50) of Cohort 2 graduates said that their subject knowledge had increased to a great extent.

One of the very few people (there were only four) who said that their subject knowledge had not increased was a maths teacher who felt that the programme was better suited to people who were already teaching computer science as opposed to those who were new to it:

> *"After the first face-to-face course I felt that the CSA course was more designed for people who are currently teaching the GCSE and needed a top-up and ideas rather than for someone new to the subject of GCSE Computing."*
>
> Maths teacher

Just under nine in ten people (88%, n=80) said that the CSA programme had increased their enjoyment of computer science, and over half (54%, n=49) reported that their enjoyment had increased to a great extent.

Graduates commented on a range of additional benefits that they had experienced because of completing the programme. Some people described the impact that the programme has had on their career, opening opportunities to secure new roles or take on additional responsibilities:

> *"[The CSA programme has] helped prepare me to lead the development of new teachers and one day become a head of department or trainer in computer science."*
>
> Computer science and maths teacher

> *"[Another benefit for me was the] certificate – [it] shows [my] willingness to do other things, and hopefully will be beneficial for securing a NQT post."*
>
> Trainee maths teacher

Even though many of the component courses had to flip from being face-to-face to a remote delivery model, participants still talked about the benefits of having been able to network with their peers:

"[I have benefitted from making] contacts with other attendees and the staff, as well as [developing] an awareness of the STEM centre and its resources."

Trainee computer science teacher

"I connected with a colleague who gave me the confidence and knowledge to apply for a new role at an independent selective school."

Computing teacher

Several respondents acknowledged the impact of the CSA programme bursary on their school, and the fact that they had been able to invest it in resources for their department:

"[An additional benefit for us has been able to] develop an after-school E-Sports club from the funding which must be used within Computing. This has developed interest in additional clubs to run after school, such as specifically coding games - linking to the GCSE specification."

Head of House and PE teacher

5.1.1. Compared with Cohort 1…

Reported impact figures are slightly lower among Cohort 2 graduates than Cohort 1, when 98% of respondents said the programme had improved their confidence to teach GCSE computer science, increased their subject knowledge, and increased their enjoyment of the subject.

5.2. On the wider school

More than half of the Cohort 2 graduates (53%, n=51) said that the programme had an impact on their colleagues. Respondents explained that they were now better able to support their colleagues and therefore to contribute more to their department:

"I was able to provide computing guidance to other teachers."

RE teacher

"I provide ad hoc support to students and colleagues taking/leading GCSE CS as a co-curricular activity. I introduced them to PRIMM, and often help to debug small programs they have written."

Physics teacher

Teachers have shared the learning and resources that they took from the programme with their colleagues and have developed new schemes of work and classroom activities as a result:

> *"I have discussed the programme with my IT/Computing colleagues and am editing my lessons (all lessons are shared) and sharing them back, sometimes using resources/ideas from the courses in my editing."*

Head of RE

Some people reported that their colleagues had gone on to complete the CSA programme themselves, with one teacher reporting that his entire department had now done it which had impacted greatly on the teaching of computer science across the school.

> *"Several people have done the programme. It has raised the profile of Computer Science in the school and other disciplines have gained a better appreciation of what it has to offer."*

Assistant Director of Maths

> *"In a department of three, two of us have completed the course and one of us is a trainer. This has, if nothing else, led to conversations about the course in school."*

Computer science teacher

More than a fifth of graduates (22%, n=20) said that the CSA programme had made an impact on the number of computer science lessons being taught in their school and the number of students taking GCSE computer science.

Teachers noted that their improved confidence and subject knowledge had contributed to more students wanting to study computer science:

> *"Year 9 students taking options were more interested in opting for computer science after my teaching practice was more improved by increased knowledge and confidence."*

Computing subject leader

> *"My improved confidence has led to more students from my 2019/20 Year 8 cohort taking CS, thanks to their enjoyment of computing lessons - we've gone to three classes from two in the previous year. Of course, that might not actually be down to me!"*

Computer science teacher

Given the timing of the survey and its proximity to the point at which Cohort 2 had completed the CSA programme, a number of people did say that it was too soon to see an impact on student figures, or the number of lessons being taught. Others felt that increases to student or lesson numbers were beyond their influence either because they were not responsible for changing the timetable or that the timetable didn't allow for any changes.

At the same time, however, some people did say that they could detect increased levels of interest among students or better levels of motivation among students. In one case, a teacher said that there were limited opportunities to change the timetable but nonetheless the programme had benefited his students:

> *"These measures are hard-burnt into the timetable. We have fewer students taking the programme than before, but they are much better informed and motivated to succeed."*
>
> Director of ICT

5.2.1. Compared with Cohort 1…

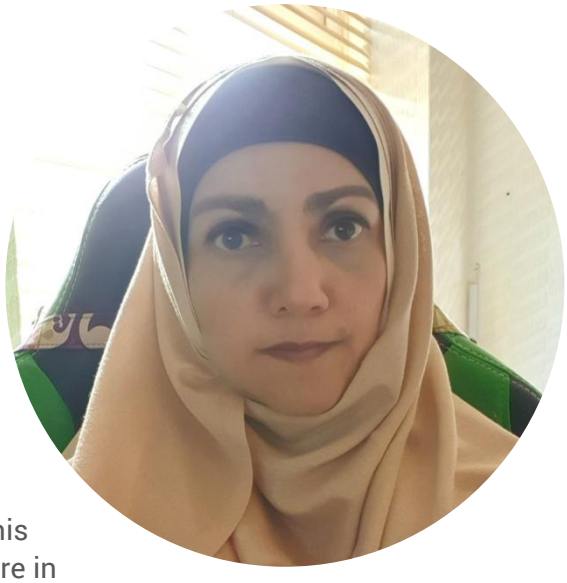
Compared with Cohort 1, fewer Cohort 2 graduates reported impact on the number of CS lessons being taught in their school (22% vs 37%) and the number of students taking CS at GCSE (22% vs 53%) after they had completed the programme.

Similarly, significantly less impact was felt among Cohort 2 graduates' colleagues, compared with Cohort 1 (53% vs 82%).

6. Case studies

Three people who participated in the telephone depth interview stage of the programme had also consented for their stories to be written up as case studies. Unfortunately, they all had computing backgrounds: the other half of the interview sample were all non-specialists but did not give permission to be written about in this way.

6.1. Fatima Maniar



Role: Head of Computing
School: Challney High School for Girls

Why did you decide to do the Computer Science Accelerator?

I was Head of Computing at my school before I started the programme, and I had more than five years of experience teaching IT and computing at Key Stage 3 and GCSE. But when the government brought in the computer science GCSE, I wanted to train myself up. I felt OK teaching it up to KS3, but beyond that I was less confident. I decided I needed to upskill.

I didn't really need to get my line manager's permission to do the programme but, had we not been in the middle of the pandemic, this might have been different. I took advantage of the fact that we were in lockdown and I did all my studying remotely during the Easter and summer holidays. Had I been in school with my teaching commitments, I wouldn't have found it so easy to take the time off to study.

What was it like getting started with the programme?

I found the diagnostic test really good. It made me realise where I needed to improve – it was helpful in identifying my areas of weakness. At the same time, I found it a bit worrying to see all of the things that I didn't know but that I would need to know if I was teaching GCSE CS!

I chose the courses based on my learning needs, such as algorithms and programming. I really liked the fact that the programme was delivered online – there was no need for me to travel to be able to do any of the courses. Because of the lockdown, those modules that would have been delivered face-to-face were instead run as remote learning sessions online which worked so much better for me. This also enabled me to do more than the required number of hours. It made sense for me to skill up in a lot of things and not just to do the minimum.

How did you find the courses that you chose to undertake?

All the courses were really high-quality - I was very impressed. It felt like they had chosen well-selected individuals to lead the units.

The programme delivered what I wanted it to. It was full of good suggestions about how to teach the content, and they made clear links to how to apply what you learned to the classroom. There are so many techniques that I picked up that I am using in my own teaching now. I felt like the programme was pitched at the right level for me. I was familiar with the vocabulary of the course and the software it covers which made it more enjoyable – I was able to fully engage with the learning.

The combination of remote learning and online courses worked well for me. I found that in some courses I needed less "hand-holding" and I was able to read the materials at my own pace. I could access the activities online – it didn't feel like I missed out by not being face-to-face with the tutors or the other participants. We had an online chat function that we used to talk to each other. On some of the modules, those delivered on FutureLearn, I was connecting with people from all over the world. It was great to be able to hear their views and to find out how they were getting on with the course.

Another thing that worked well for me was the flexibility of the programme. There were multiple sessions to choose from, run at different times and the communications about the logistics were very good.

I was very lucky to be supported by a Computer Science Champion while I completed the programme. I had three sessions with him: he supported me during lockdown and helped me come up with ideas of what to do in the classroom. He sent me resources from other schools, he answered my questions and he has even made a visit to my school. Having his support made a huge difference. If I ever had any issues he was there to help me.

What has completing the programme done for you?

I'd definitely say that my knowledge of computer science has increased to a great extent now, and I enjoy it as a subject so much more. I have integrated what I learned into my teaching – including my KS3 lessons so that, when they move onto KS4, they are using the right language and they are familiar with the software.

My confidence to teach computer science GCSE has increased so much – I applied to become a government EdTech demonstrator, teaching other teachers how to use software, which I wouldn't have done before I did the CSA.

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

My students wouldn't necessarily know that I've done the programme, but they are benefitting from the improved resources that I am now able to put together for them. Our results are absolutely brilliant - they are always in the 90s – and we are one of the leading departments in the school.

The bursary that came with the programme has enabled us to buy a lot of hardware – we have invested in my department. We are trying to make our students' learning more physical, so we bought Raspberry Pis. Our goal is to get them more engaged by helping them to see their programming in action. I really, really enjoyed the CSA programme. I'd love to see the NCCE offer more online and remote learning for teachers – we are parents and have families too so can't always travel – but this makes it so easy for us to train!

6.2. Allison Forrest

Role: Second in Computing Department

School: Sandhurst School

Why did you decide to do the Computer Science Accelerator?

When I saw the CSA programme advertised, I thought that it would be a great opportunity for me and for my students. I wanted to increase my subject knowledge: I've actually taught computer science for the last four years, but I knew that I needed to focus on the content within paper 2 of the GCSE that covers programming and algorithms.

My school was very supportive of me undertaking the programme. They liked the idea of the bursary for our department and also saw it as an opportunity for us to get revision materials for the students.

What was it like getting started with the programme?

I began with the diagnostic test, which helped me to decide what to focus on. The test suggested I needed to do more work on networking and I agreed! I also did the face-to-face algorithms course – mainly so that I could help my students better. I have found that they tended to struggle with those questions so I wanted to deepen my knowledge and understanding to be able to teach them. I was also new to programming so wanted to be better at Python.

How did you find the courses that you chose to undertake?

I found the whole programme really useful. The online courses were great: they included videos, interactive activities, forums where we could ask the course leader questions and opportunities to engage with the other learners on the module via the FutureLearn platform.

Interestingly, I found the blended learning approach used in the remote delivery modules prepared me well for the online teaching I had to do myself during lockdown!

The content was pitched at the right level for me – it wasn't too above me, it all felt directly relevant and good for me to pass to my students. I particularly enjoyed the Programming with GUIs course – I applied it to my teaching straight away.

All the courses I completed had high quality, good instructors. The quality of the courses was better than I expected, and the online videos were more useful than I thought they would be too. There were plenty of opportunities for interaction, even once the face-to-face ones went online. We had the space to ask questions when we needed to and the combination of courses I completed prepared me well for the final test.

What has completing the programme done for you?

I definitely feel more confident teaching the algorithms and programming paper. When it comes to laying out questions and teaching my students how to do them, I find it much easier now. My students are showing better understanding of these topics now too. And since this was my main aim for the course, I am really pleased.

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

Since completing the programme, I have actually changed jobs, but I have brought what I learned to my new school. I have shared the resources with my colleagues and have recommended that they might go on the programme too. It's really useful if you have certain topics or subject areas that you want to focus on or to be able to teach better. It's also useful to be able to network with other colleagues and to learn from each other. Computer science teachers often work in small departments or in isolation, so we need these opportunities to work together.

It was actually one of the course instructors who encouraged me to apply for my new job. The programme has made me more confident in general so maybe it helped me to get the job. My subject knowledge was definitely better for the interview!

6.3. Nicola Mounsey

Role: Head of Computing, and Computer Science CPD facilitator

School: Calday Grange Grammar School

Why did you decide to do the Computer Science Accelerator?

I wanted to get an understanding of what the programme was and how it worked, so that I could confidently recommend it to non-specialists who might want to start teaching GCSE computer science. I didn't need the training for myself, as I run GCSE level training sessions for colleagues already. I chose to do the programme during lockdown as I knew that would mean I didn't need to attend any face-to-face sessions. My school has been very supportive of other colleagues completing the programme during school-time, however – we have had three teachers complete it, of whom one was a newly qualified teacher, and another was a non-specialist.

What was it like getting started with the programme?

I completed the diagnostic test at the start of the programme, which suggested that I needed to focus on networks. I chose a few courses, including Python (because I'm a Java programmer, so I wanted to familiarise with the object-orientated side), cyber-security because it's something my students are interested in, and algorithms as I was interested in how it will be taught.

How did you find the courses that you chose to undertake?

I found the remote learning courses made it possible for me to complete the programme: had I needed to attend face-to-face sessions I wouldn't have been given the time out of the classroom. The online modules work well as they can fit around whatever else you are doing. I also like the fact that you can go back to the courses and access the examples they used.

The final test was useful: it really does test you. If you have followed the programme properly, taken the advice from the initial test and completed the courses that it recommends, then you should be able to see progress by the end and pass the test.

What has completing the programme done for you?

I'm now able to let my A level students choose between studying Python and Java. The course definitely helped me with my knowledge of Python. Historically, if we've had any students coming into our school with Python, we were unable to continue their studies of it. But this is the first year during which I've been able to teach both.

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

My students have been more engaged in computer science – they don't find it as scary a subject. We have also had a good look at cybersecurity as a school. Two of my colleagues have now also completed the CSA programme. One was an NQT who came with computer science qualifications and the other is an art teacher who has experience of teaching years 7 and 8 computer science. Both have told me that the programme has improved their confidence and with one colleague particularly finding the database course useful.

Our department has benefitted from the bursary that was associated with the programme. The funds have been earmarked for us so we have been able to kit out some STEM Clubs and buy robotics equipment to use in our lessons, which wouldn't have been possible otherwise.