



EVALUATION OF THE IMPACT OF NATIONAL SCIENCE LEARNING NETWORK CPD ON SCHOOLS

Final evaluation report

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Acknowledgements

This project was undertaken by a small team from Isos Partnership, led by Ben Bryant and Natalie Parish. We were supported by Andrew Baxter, who helped during the fieldwork stages to carry out telephone interviews and visits to schools, and by Julian Clarke, who carried out the detailed data analysis and helped us to identify a sample of schools to take part in the project. Susannah Turner and Celia Hope liaised with schools to invite them to take part in the project and arranged our interviews with subject leaders.

We had the great privilege to speak to and visit staff and pupils from a number of extremely impressive schools that are pioneering exciting and creative ways of stimulating young people's interest in science and inspiring their learning. Some examples of these approaches are highlighted in this report and in the accompanying document containing the full case studies. We are very grateful to the all of the school and subject leaders, teachers and technicians, and young people, as well as a small number of national experts in science teaching and learning, who generously shared their views and gave their time to this project.

Executive summary

Purpose and aims of the evaluation

In spring 2014, MyScience commissioned Isos Partnership to undertake an evaluation of the impact and benefits of schools engaging with subject-specific science continuing professional development (CPD) from the National Science Learning Network (NSLN) and the National STEM Centre (STEM stands for science, technology, engineering and mathematics).

There were two main aims of the evaluation:

1. **to explore the impact of the NSLN and the National STEM Centre CPD on educators, schools and pupils** – we sought to explore the overall impact of engagement with science CPD as well as to understand whether this differed according to the characteristics of the school, such as their phase or local context; and
2. **to explore how schools that made regular and strategic use of CPD from the NSLN and the National STEM Centre maximised the impact of the CPD they accessed** – we did this by focusing specifically on how those schools planned and used science CPD, how this differed from other schools, and whether there were implications that could be drawn about how to use science CPD most effectively to improve science teaching and learning.

The research ran from April 2014 to July 2015. During the course of the project, we engaged a total of 114 schools across England – 38 primary schools and 76 secondary schools. We approached the evaluation in three phases. First, we carried out a review of existing evaluation and research on the use and impact of science CPD on schools and undertook an initial analysis of schools that had used the Network's CPD. We used this to develop a sample of schools to invite to take part in the project, as well as to develop a set of research tools to use during our fieldwork.

Second, we gathered evidence from 104 subject leaders (32 in primary schools and 72 in secondary schools). This represented a response rate of 18%. We carried out telephone interviews with 59 subject leaders, which included a set of standard survey questions, while a further 45 subject leaders completed an online version of the survey. Based on these interviews, we also captured judgements about whether a school was a 'strategic user', 'planned user', 'semi-planned user', or 'ad hoc user' in their approach to planning, embedding and evaluating the CPD that they accessed from the Network.

Third, based on the telephone interviews and further data analysis, we sought to identify schools that were strategic users. We invited these schools to take part in a short visit that we would use to gather additional information from school and subject leaders, teachers and technicians, and pupils about science teaching and learning in the school. We visited 17 schools, seven of which had taken part in telephone interviews. From these visits, we developed short case studies on which we have drawn, along with the evidence gathered from our survey, interviews and data analysis to inform this final evaluation report.

What impact do schools achieve from using CPD from the National Science Learning Network and the National STEM Centre?

To answer this question, we have looked at the evidence of impact on staff who participated in Network CPD, on their colleagues in school, on staff career progression and retention, on partner schools, and on pupils' learning.

Impact on participants: Almost nine in 10 schools saw a high or very high level of impact on the staff who accessed science CPD from the Network

In response to our survey, 88% of subject leaders said that their schools had seen a high or very high level of impact on the staff who had participated directly in the CPD that they had accessed from the Network. These findings corroborate the data collected through the Network's impact toolkit, which suggested that between January and May 2015, 96% of CPD participants reported some positive impact on themselves as practitioners. Typically it was the enthusiasm, subject knowledge, confidence and motivation of staff that the science leaders first cited when describing the impact that the Network's CPD had on those who took part. When the Network CPD had focused on developing scientific-enquiry skills or had whole-school relevance, subject leaders reported the sustained impact they had seen on teaching practice in the classroom.

Impact on colleagues in the school: Almost two in three schools saw a high or very high level of impact on colleagues of the members of staff who accessed CPD from the Network

In response to our survey, 63% of subject leaders said that their schools had seen a high or very high level of impact on the colleagues of staff who had accessed CPD from the Network. While this is lower than the reported impact on staff who participated directly in the CPD, nonetheless it is encouraging that almost two-thirds of respondents saw that the positive impact of the Network CPD had spread beyond the direct participants to have a wider benefit to colleagues in the department or the school. Our survey data also suggest that there is a strong link between those schools that reported having high expectations that the outputs of attending science CPD would be shared and seeing an impact beyond those who attended the science CPD. Furthermore, primary school subject leaders (83%) were more likely to report a high or very high impact on colleagues than their secondary counterparts (54%). The former suggested this was because, when they accessed the Network subject-specific CPD, they were doing so as a representative of the school and were expected to disseminate their learning upon their return.

In addition to colleagues *in their own school*, we also asked subject leaders if they had seen evidence of the impact of the CPD they had accessed on *other schools with whom they worked in partnership*. It was telling that the most common answer given (by one in three subject leaders) was 'not applicable': many described how they did not work with other schools to share science CPD learning and teaching practices, and therefore could not comment on impact. We did find, however, that primary schools (43%) were more likely to report a high or very high level of impact on partner schools than secondary schools (13%). We also found that the most strategic users of the Network's science CPD were more likely to be involved in sharing science CPD learning with other schools.

Impact on staff progression and retention: six in 10 schools saw that the Network's CPD had made a strong or very strong contribution to staff progression and retention

In general, subject leaders found it more difficult to describe the impact of the Network's CPD on staff progression and retention than many of the other impact-related questions: 10% felt unable to

comment. Nonetheless, 60% of subject leaders reported that the Network's CPD had made a strong or very strong contribution to better career progression and retention for staff in their school. The schools that linked the selection and following-up of CPD to the staff appraisal process were more likely to be confident in describing the impact of the Network's science CPD on retention and progression. We also found that primary and secondary schools were likely to describe impact in this area differently. Secondary schools, on the one hand, were more likely to reflect on the science teaching career paths of those individuals who had taken part in the CPD. Primary schools, on the other hand, were more likely to reflect on how science CPD contributed to a holistic approach to learning within the school and a sense of staff being valued, which in turn contributed to good staff retention.

Impact on pupils: eight in 10 schools saw a high or very high level of impact from the Network's CPD on pupils' learning

The very large majority of subject leaders (82%) that took part in our survey or interviews reported a high or very high impact on pupils. Subject leaders cited evidence of increased engagement in science lessons, often as a result of more investigative approaches in science lessons. They also described evidence of impact in terms of pupils' investigative skills, enthusiasm for extra-curricular science activities, as well as on pupil progress and attainment. Interestingly, primary science leaders (43%) were more likely to report 'very high' levels of impact compared to their secondary counterparts (22%). The former were more likely to base their judgement on pupils' enjoyment of science and motivation to learn, while the latter were more likely to be more tentative about what they could evidence based on pupil progress and examination of achievement data. A number of secondary schools, including the strategic users that we describe in our case studies, also reported an impact on greater take-up of triple science at Key Stage 4 and of science subjects at Key Stage 5.

Do national data corroborate subject leaders' perception of impact?

The vast majority of subject leaders were confident that the CPD that they were accessing from the Network was having an impact in their schools, particularly on those members of staff who directly participated in the CPD and on pupils' learning. As part of our evaluation, we tested this view against the national data on pupil attainment and progress.

Among primary schools, we found that schools that have engaged systematically and to a high degree in the Network's CPD are, on average, starting from a lower base of science attainment than other schools, but are improving more rapidly and show higher value added than other schools. The data strongly suggest that engaging in moderate to high levels of the Network's science-specific CPD, in a planned and consistent fashion across at least a two-year period, can lead to benefits in terms of faster improvement and better value added for schools in the primary sector.

Secondary schools that engage in high levels of CPD from the Network tend, on average, to be higher-attaining than those who engage in less or no CPD. Those that engage in a moderate to high level of CPD from the Network systematically over the period 2012 to 2014 saw higher percentages of pupils attaining two or more science GCSEs at A*-C, and are achieving a higher VA score in science. Interestingly, it also seems to be the case that distributing the learning between a minimum of two and a maximum of 10 people has a beneficial impact on both these measures.

For both primary and secondary schools, at a national level the data did not suggest that accessing particular types of CPD from the Network (e.g. those focused on subject-knowledge compared to those focusing on building leadership skills) was associated with greater gains in pupil attainment and progress. Among both primary and secondary schools we did find, however, that those schools that

engaged in CPD courses and were using National STEM Centre resources saw higher rates of pupil progress (as measured by overall value-added scores in primary and science value-added scores in secondary) than those schools using either the CPD or the resources in isolation.

Schools that adopt a more strategic approach to planning, embedding and evaluating CPD learning see a greater impact than other schools accessing CPD from the Network

During the evaluation, school and subject leaders stated very clearly that the key to maximising the impact of CPD was adopting a strategic approach to planning CPD engagements, embedding the learning within pedagogical practice and evaluating its impact on teaching and learning. To test this, we used the data from our interviews with subject leaders, specifically our judgements about how strategic an approach to planning, embedding and evaluating CPD the school used. We then compared the pupil performance data of the most strategic users of science CPD with that of the other schools that took part in this evaluation. We found that, among both primary and secondary schools, the more strategic users of CPD were, on average, performing slightly better and improving slightly faster (or, in the case of secondary schools, maintaining their results more consistently) than the other schools in our sample.

How do schools maximise the impact of science CPD?

The impact on a school of the science CPD that they access is influenced significantly by the approach that the school takes to science CPD. During this evaluation, we have found that this approach comprises four phases: planning, embedding, evaluating and sustaining. From our interviews with subject leaders and our visits to schools, we have identified three key things that the most strategic users of science CPD do to maximise the impact of science CPD at each of these four phases. This makes up the twelve key characteristics of strategic users of science CPD, captured in the figure below. While we have framed these in terms of a school’s approach to *science* CPD, these characteristics are equally applicable to how a school approaches subject-specific CPD in other subject areas.

Planning	<ul style="list-style-type: none"> Establishing clear priorities to guide CPD, informed by frank self-evaluation Pro-active planning, aligning school, subject and staff development priorities Identifying the right people to champion and lead CPD learning in school
Embedding	<ul style="list-style-type: none"> Giving staff encouragement and time to implement CPD learning in their classroom Regular routines for structured, practical sharing of learning with colleagues Supporting staff to embed CPD learning in their planning and practice
Evaluating	<ul style="list-style-type: none"> Being clear, in advance, about the difference you expect from the CPD Is practice changing? Seeing first-hand the difference in the classroom Using a range of measures to judge the impact on pupils’ learning and engagement
Sustaining	<ul style="list-style-type: none"> Using regular planning cycles to refine and improve new ideas and practice Turning CPD champions into leaders to embed and improve teaching and learning Celebrating and showcasing success within and beyond the school

Planning: The most strategic users of science CPD establish clear priorities, align staff and school development priorities, and identify the right people to champion and lead CPD learning

In response to our survey, eight in 10 subject leaders reported that they were clear or very clear about why their school accessed the science CPD it had from the Network. We found that primary schools were more likely to take a strategic approach to planning science CPD than secondary schools. We found that the most strategic users of Network CPD established clear priorities for the CPD that they accessed. This was informed by robust and granular analysis of pupil progress and attainment, and honest and frank self-assessment of the strengths and areas for development of science teaching. These planning processes were aligned to the staff appraisal process so that school, subject and staff development priorities could be brought together and aligned. These schools then developed and communicated a clear plan about how they aimed to improve science teaching and learning and the role science CPD would play in this. Lastly, what differentiated the most strategic users of science CPD was the deliberate way in which school and subject leaders identified the right individuals to access CPD and to champion the implementation of the learning gained from the CPD across the school.

Embedding: The most strategic users of science CPD maintain structured routines and opportunities for practically-focused sharing and coach staff to embed learning in their classroom practice

Among the schools that took part in this evaluation, there was near-unanimous recognition of the fact that the way in which learning from science CPD is implemented, shared and embedded within classroom practice was crucial to maximising its impact. Fewer schools, however, considered that they were effective in implementing what staff had learned from science CPD. In particular, our survey data highlighted a mismatch between the expectation that staff would share learning and the support schools provided to ensure this happened. For example, just over half (51%) of the subject leaders said that they had a very high expectation that staff would share learning from science CPD, but only one in five (20%) said they would provide very high levels of support to facilitate this. We did find, however, that this mismatch between expectation and support was less stark among responses from primary schools than secondary schools.

We found that what differentiated the most strategic users was that they allowed staff time to implement and test what they had learned in school, perhaps working with a colleague or a small team. The sequencing is important here, since it enabled staff to reflect on what they had learned while it was still fresh in their minds, and to be in a position to share not only what they had *learned* but also what they had *done* in their own classrooms. What was vital to these schools was having a set of routines that were used to share learning and pedagogical practices regularly and systematically – these included both regular “speed CPD” sessions to boost colleagues’ knowledge and skills, and more in-depth collaborative planning sessions. Furthermore, strategic users of science CPD used coaching techniques to work with staff to build their confidence to adopt new teaching strategies and ensure that these approaches were being embedded and making a difference consistently across the school.

Evaluating: The most strategic users of science CPD set out in advance what difference they expect to see from accessing CPD and systematically use a range of routines and measures to track impact

Past studies have found that CPD participants can find it difficult to pinpoint the difference that CPD has made, particularly to pupils’ learning. This finding has been borne out by our evaluation. For

example, while we judged 47% of the schools we interviewed to be strategic users in relation to planning science CPD and 32% to be strategic users in relation to embedding science CPD, we judged only 14% of schools to be strategic users when it came to evaluating science CPD. We did, however, find that the primary schools (25%) we interviewed were more likely to be strategic users in relation to evaluation than secondary schools (8%).

What differentiated the most strategic users was that they set a baseline in advance and ensured that being clear about the difference they would expect to see and how they would track it was built into how they planned for the Network's CPD they would access. These schools then used a range of routines and measures to identify evidence of impact. These included pupil-level attainment and progress data, "soft" indicators such as pupils' engagement in lessons, feedback from staff and pupils, and learning walks, lesson observations and book scrutiny to see how the Network's CPD was shaping classroom practice. In other words, strategic users of science CPD used their existing processes for assessing the quality of teaching and tracking data on pupil learning systematically, explicitly and deliberately to identify evidence that science CPD was making a difference in the classroom.

Sustaining: The most strategic users have a robust planning cycle to review and refine their practice and science CPD engagements continuously, and use aspiring leaders to showcase successful new practices across and beyond the school

The most strategic users to whom we spoke during this evaluation did not see the three preceding phases – planning, embedding and evaluating – as one-off activities. Instead, they saw them as forming a cycle of constantly refining and improving science teaching and learning and topping this up with judiciously-selected, high-quality science CPD. They do this not only to improve their own teaching and learning, but to build their leadership capacity so as to be able to spread their practices to other subject areas and partner schools – and, crucially, to test and refine them in light of peers' feedback.

Do schools' priorities and the stage in their improvement journey influence the Network CPD that they access?

In this evaluation, we found that many schools, including the most strategic users of science CPD from the Network, did not plan the CPD they would access more than a year in advance. They argued that external factors, such as changes to national policy, and internal factors, such as staff turnover or newly-identified staff needs, were important determinants of their science CPD plans. For this reason, we did not find that we could identify clear sequences in the CPD that schools had accessed from the Network – for example that one type of CPD was a common "entry-point" into the Network, or that one particular course often led to another. We did, however, make two further findings.

First, we looked at whether schools tended to access the Network's CPD before they registered with the National STEM Centre or vice versa. We found that primary schools were twice as likely to have registered with the National STEM Centre before they accessed CPD from the Network, but secondary schools were twice as likely to have accessed CPD from the Network before they registered with the National STEM Centre.

Second, when we analysed the Network CPD accessed by the 36 schools that we invited to take part in case study visits, we found that schools were more likely to access particular forms of Network CPD depending on the stage they were at in their improvement journey. We found that schools that were at the "*building the foundations*" stage of their journey focused on accessing Network CPD to support

them to put the building blocks of a new approach to science teaching in place – primary schools focused on enquiry-based approaches, secondary schools on subject-knowledge enhancement. We also found that what characterised primary schools that were at the “good-to-great” and the “sustaining excellence” stages of their journey was developing the role of the subject leader, while for secondary schools it was CPD focused on cutting-edge scientific developments and supporting students to progress to higher study and careers in science.

Implications for educators involved in improving science teaching and learning

In this report, we describe the evidence of the impact that regular, systematic engagement in science CPD from the Network, combined with regular use of resources from the National STEM Centre, can have on schools. We have shown that there is evidence to suggest that the most strategic users of science CPD are performing better and improving faster than other schools that are also using CPD from the Network. We have also described how the most strategic users maximise the impact of the science CPD that they access.

We consider that this has certain implications for all those involved in seeking to improve science teaching and learning in English schools, specifically school and subject leaders, teachers and technicians, and CPD providers in the Network. Some of these implications are obvious, and some are already taking place. Nevertheless, we have captured these implications as a set of helpful reminders and summarise the approaches of the most strategic users of science CPD so that educators and pupils in a far broader range of schools may benefit.

	School and subject leaders	Teachers and technicians	CPD providers in the Network
Planning	Develop a clear plan for CPD, informed by honest self-evaluation and pick the right people to enthuse others.	Choose CPD that aligns your own professional development and the school’s or department’s strategic priorities – be selective.	Target the CPD offer at specific stages in a school’s journey, and at particular stages in the development of teacher, technician or leader.
Embedding	Create regular opportunities not only to share, but to embed, CPD and support staff to plan and implement this in the classroom.	Set a target to achieve within a week of the CPD, including how you will influence at least one colleague’s classroom practice.	Ensure CPD activities focus not only on what the participant will do differently, but on how they can support colleagues to do the same.
Evaluating	Be clear what difference you want to see from the CPD, how you will know, and then track impact in the classroom.	Be clear in advance what difference you expect the CPD to make in your classroom – establish a baseline and check for improvements.	Continue to embed within CPD activities strategies for identifying evidence of impact of CPD on teaching and learning.
Sustaining	Celebrate success and create a cycle of continually evaluating and improving practice to foster a learning culture in your school.	Seek out opportunities to report on effective new practices to colleagues, leaders, governors and peers in other schools.	Foster subject-specific collaboration between schools through Science Learning Partnerships and cluster-based approaches.

Main findings

Impact of the Network's CPD reported by subject leaders

The vast majority of subject leaders were confident that the CPD that they were accessing from the Network was having an impact in their schools, particularly on pupils' learning.

- **Impact on participants:** almost nine in 10 subject leaders (88%) saw a high or very high level of impact on the staff who accessed science CPD from the Network.
- **Impact on colleagues:** almost two in three subject leaders (63%) saw a high or very high level of impact on colleagues of the members of staff who accessed CPD from the Network. Primary school subject leaders (83%) were more likely to report a high or very high impact on colleagues than their secondary counterparts (54%).
- **Impact on other schools:** the most strategic users of CPD from the Network were more likely to be involved in sharing science CPD learning with partner schools than other users of Network CPD. Primary school subject leaders (43%) were more likely to report a high or very high level of impact on partner schools than secondary schools (13%).
- **Impact on staff progression and retention:** six in 10 subject leaders (60%) saw that the Network's CPD had made a strong or very strong contribution to better career progression and retention for staff in their school.
- **Impact on pupils:** eight in 10 subject leaders (82%) saw a high or very high level of impact from the Network's CPD on pupils' learning.

Impact of the Network's CPD corroborated by national data analysis

- **Impact on primary schools:** primary schools that engage in moderate to high levels of the Network's science-specific CPD in a planned and consistent fashion across at least a two-year period can see benefits in terms of faster improvement and better value added.
- **Impact on secondary schools:** secondary schools that engage in moderate to high levels of CPD from the Network systematically over the period 2012 to 2014 saw higher percentages of pupils attaining two or more science GCSEs at A*-C, and are achieving a higher value added score in science.
- **Use of Network CPD and National STEM Centre resources:** schools that engaged in Network CPD courses and were using National STEM Centre resources saw higher rates of pupil progress (as measured by overall value added in primary and science value added in secondary) than those schools using either the CPD or the resources in isolation.
- **The most strategic users of Network CPD:** among both primary and secondary schools, the more strategic users of the Network's CPD were, on average, performing slightly better and improving slightly faster (or in the case of secondary maintaining their results more consistently) than the other schools that accessed CPD from the Network.

Maximising impact

We identified what the most strategic users of the Network's CPD do to maximise the impact of the science CPD that they access.

- **Planning:** the most strategic users establish clear priorities, align staff and school development priorities and identify the right people to champion and lead CPD learning. Eight in 10 subject leaders reported that they were clear or very clear about why their school accessed the science CPD it had from the Network.
- **Embedding:** the most strategic users give staff who have accessed science CPD time to reflect and test what they have learned in their classroom, maintain structured routines and opportunities for practically-focused sharing, and coach the wider team of science teachers and technicians to embed learning in classroom practice. There is, however, a mismatch in schools between the expectation to share learning science CPD and the support and time afforded to staff to do so. Just over half (51%) of the subject leaders said that they had a very high expectation that staff would share learning from science CPD, but only one in five (20%) said they would provide very high levels of support to facilitate this.
- **Evaluating:** the most strategic users set out in advance what difference they expect to see from accessing science CPD and systematically use a range of routines and measures to track impact. These draw on schools' existing processes for assessing the quality of teaching and pupil learning, and use these explicitly to identify evidence of impact from science CPD in the classroom. Fewer of the schools that took part in this evaluation took a strategic approach to evaluation compared to how they planned and embedded science CPD.
- **Sustaining:** the most strategic users have a robust planning cycle to review and refine their practice and science CPD engagements continuously, and use aspiring leaders to showcase successful new practices across and beyond the school.

Introduction

Purpose and aims of the evaluation

In spring 2014, MyScience commissioned Isos Partnership to undertake an evaluation of the impact and benefits of schools engaging with subject-specific science continuing professional development (CPD) from the National Science Learning Network (NSLN) and the National STEM Centre (STEM stands for science, technology, engineering and mathematics).

There were two main aims of the evaluation:

1. **to explore the impact of the NSLN and the National STEM Centre CPD on educators, schools and pupils** – we sought to explore the overall impact of engagement with science CPD as well as to understand whether this differed according to the characteristics of the school, such as their phase or local context; and
2. **to explore how schools that made regular and strategic use of CPD from the NSLN and the National STEM Centre maximised the impact of the CPD they accessed** – we did this by focusing specifically on how those schools planned and used science CPD, how this differed from other schools, and whether there were implications that could be drawn about how to use science CPD most effectively to improve science teaching and learning.

Background on the National Science Learning Network and the National STEM Centre

The NSLN and the National STEM Centre are operated by MyScience, which was established in 2004 by the White Rose University Consortium (comprising the universities of Leeds, Sheffield and York) and Sheffield Hallam University. The NSLN incorporates the National Science Learning Centre (opened in 2006) and a regional programme for science CPD. In terms of the regional programme, since August 2013, this has comprised 51 science learning partnerships, which are led by schools, colleges or other education institutions to provide schools and colleges with access to high-quality, local science CPD. In addition to the National Science Learning Centre, MyScience also operates the National STEM Centre (opened in 2010).

Scope of the evaluation

This report has focused on primary and secondary schools in England that have accessed CPD from the National Science Learning Centre, the 51 science learning partnerships and the National STEM Centre. The research ran from April 2014 to July 2015. During the course of the project, we engaged a total of 114 schools – 38 primary schools and 76 secondary schools.

For the purposes of brevity, in this report we use the term ‘the Network’ to include the National Science Learning Centre, the 51 science learning partnerships and the National STEM Centre.

Our approach

The evaluation was carried out by a small team from Isos Partnership led by Ben Bryant and Natalie Parish, supported on our fieldwork by Andrew Baxter and supported on the detailed data analysis by Julian Clarke.

In order to fulfil the two aims of the research, we approached the evaluation in three phases. We designed the approach in order to enable us to gather feedback from a wide range of schools as well as to explore examples of effective practice in detail with a smaller number of schools. What we did in each phase is set out below.

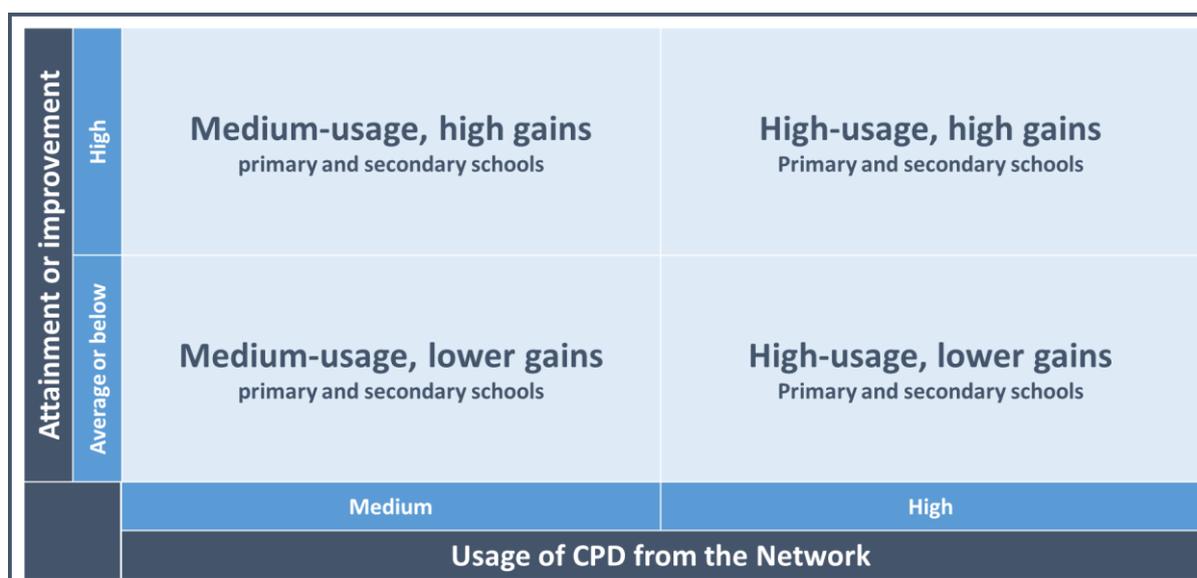
Phase 1: Analysing the existing evidence to inform our evaluation strategy

At the outset of the evaluation, we undertook a detailed analysis of the data held by MyScience about schools' use of the Network's CPD and matched this to the National Pupil Database (2013 data). We did this for two reasons. The first reason was to help us to identify a broadly representative sample of schools to invite to participate in the project. We constructed our sample of schools on three main factors:

1. **phase** – we wanted to ensure we were engaging both primary and secondary schools;
2. **usage of CPD** – we wanted to ensure we included schools that had accessed medium and high levels of CPD from the Network; and
3. **performance in science** – we wanted to ensure we engaged a sufficient number of schools that were performing well in science, using factors such as attainment in science and improvement over a three-year period, but also contrast these with some schools where progress was slower or attainment was lower.

The two-by-two grid below captures our approach to constructing our sample.

Figure 1: How we constructed our sample of schools



The second reason for undertaking the detailed data analysis was to identify key questions and themes to test during the evaluation. We combined the data analysis with a review of previous studies of the impact of the Network's CPD.

The Network collects data from participants in its CPD activities about the level of impact on them, on their colleagues and schools, and on pupils. The data from 2013-14 (available [here](#), and updated annually) show that, on average, nine in 10 CPD participants report that the CPD they have accessed from the Network has had an impact on them, their school and their pupils. The most common form of impact on participants is on their confidence, skills and classroom practice, but there is also some evidence that this can contribute to their job satisfaction and career progression (particularly in secondary school). Other studies have identified evidence of the impact of the Network's CPD on pupils' progress and attainment, as well as engagement and enjoyment of science, but have highlighted that the schools are not always confident about how to pinpoint the difference that CPD has made. These and other findings, such as thematic reports by Ofsted and the *Trends in International Mathematics and Science Study* (TIMSS), also highlight the importance of the way the school plans, shares, embeds and evaluates learning from CPD in order to maximise impact.

We also analysed past studies to identify evidence about how the level and type of impact from the science CPD differed according to the characteristics of the school. Although there is comparatively less evidence about these questions than those about overall levels of impact, there were three points that were particularly relevant to our evaluation.

1. **Differences by phase** – the *Trends in International Mathematics and Science Study* (TIMSS) in 2011 and Ofsted's thematic report in 2013, *Maintaining curiosity*, found that secondary schools are more likely to access science (and indeed subject-specific) CPD than primary schools. The Network's data show that, between 2005 and 2014, 78% of secondary schools in the UK had accessed CPD from the Network compared to 9% of primary schools. Evidence including the 2013 Ofsted report suggested that primary schools were more likely to report impact on staff confidence and impact beyond the classroom of the member of staff who had accessed the CPD than secondary schools. We also found evidence, including a 2012 study by Claire Wolstenholme and colleagues, that secondary schools were more likely to report an impact on staff career progression.
2. **Differences by levels of usage** – we found evidence in one 2012 study of the Network, carried out by Charlotte Clarke and Graham Thom, that suggested that schools saw diminishing returns from very high usage of CPD, but that it was difficult to pinpoint precisely where the "tipping-point" came. On the other hand, we also found evidence from another study of the impact of targeted CPD, led by Judith Bennett in 2010, that suggested the impact of science CPD tailed off over time and needed to be refreshed to sustain high-quality science teaching and learning.
3. **Differences by school priorities** – we found evidence that a school's CPD needs differed according to their overall improvement priorities. For example, Helen Everett's 2013 study of leaders' and teachers' views of subject-specific CPD found that for schools in challenging circumstances, the focus on whole-school improvement took precedence over subject-specific CPD, while the latter was often only prioritised once schools were felt to be on an "even keel". Other studies of science and science CPD, including those by the National Audit Office in 2010 and Ofsted in 2013, as well as a review of the research evidence by Mary Ratcliffe in 2012, also suggested that there is an association between high-quality science provision and the use of science-specific CPD, but that the driving factor may be the overarching ethos of the school.

Our review of these thematic and evaluative studies suggested that there is a wide range of reasons as to why a school might access science CPD, and an array of different strategic aims that the CPD

might serve. The patterns and differences in the impact identified by these studies pointed to the importance of strategic leadership, structured dissemination and focused evaluation in maximising the impact of science CPD.

Based on the data analysis and our review of previous evaluation studies, we developed two main evaluation tools to use in our fieldwork with schools. These were a short question framework and a survey, which focused on two main themes:

1. **the school's approach to science CPD** – how the school planned, embedded and evaluated the science CPD that they accessed; and
2. **the impact of the CPD they had accessed from the Network** – on participants, colleague teachers and technicians, on staff progression and retention, on pupils, and on other schools.

The question framework and the survey questions were used during our telephone interviews with science leaders. The survey itself, which can be seen at Annex A, was also made available online so that science leaders who were not able to take part in the interviews but did want to contribute to the evaluation were able to do so. The survey asked subject leaders to answer a range of questions about aspects of their approach to science CPD and the impact of the CPD they had accessed from the Network using a scale of 1 (very high) to 4 (very low).

Phase 2: Interviews with science leaders in primary and secondary schools

In total, we identified 567 schools that were invited to take part in the evaluation. These schools were invited to take part in three separate waves during the autumn term of 2014 and the spring term of 2015. We approached the schools and asked if the science leader in the school would be happy to take part in a short telephone interview. Science leaders that were not able to take part in an interview but were keen to contribute to the evaluation were offered the chance to complete the short online version of our survey.

A total of 104 subject leaders (18% of those invited) took part during this phase of the evaluation – 59 subject leaders took part in a telephone interview and 45 subject leaders completed the online version of the survey. Of these 104 subject leaders, 32 were from primary schools and 72 were from secondary schools.

In addition to capturing information about the school's approach to science CPD and the impact of the Network's CPD on the school, for the 59 subject leaders that we interviewed, we recorded judgements about how strategic the school's approach was to planning, embedding and evaluating science CPD. We did this using a four-point scale, and judging whether the school was a strategic user, a planned user, a semi-planned user or an ad hoc user of science CPD. The grid we used to capture our judgements is at Annex B of this report. We took this approach for two reasons. First, we recorded these judgements to enable us to draw comparisons across all of the schools that took part in the evaluation, including to test whether there were any characteristics common to schools that were more strategic in their use of science CPD. Second, we used these judgements to identify examples of best practice in schools in order to develop case studies.

Phase 3: In-depth study visits to primary and secondary schools to develop case studies of innovative practice

In addition to gathering and analysing evidence of the impact of the Network's CPD, the other aim of this evaluation was to understand how the most effective and strategic users of CPD from the Network planned, embedded, evaluated and sustained their use of science CPD. In addition to the interviews

and survey with science leaders, we also visited a small number of schools to understand their approach and the difference this was making to science teaching and learning in more detail. We identified the schools we invited to take part in case study visits in two ways:

1. **from our interviews with subject leaders** – we identified examples of effective practice from among the 59 schools that we interviewed; and
2. **data analysis** – we supplemented this by analysing the updated data on usage of the Network CPD and the National Pupil Database (2014 data) to identify a small number of additional primary and secondary schools that had accessed high levels of science CPD from the Network and seen significant improvements in science over the past three years.

Specifically, through our data analysis, we sought to select schools that had used high levels of CPD from the Network but were at different stages in their improvement journey in science. Informed by our earlier fieldwork interviews and case study visits, we based our selection on three different stages of that journey, set out in figure 2 (below).

Figure 2: Identifying schools at different stages of their improvement journey in science

	Description of the stage of the journey	The criteria we used
Sustaining excellence	Schools that are already high-performing schools overall and in science. These are schools that are using science CPD to plan pro-actively for new developments, and to extend the knowledge and skills of their staff and enhance pupils’ experience of learning science.	We selected schools that had been judged by Ofsted to be outstanding, had sustained this judgement, and had sustained very high levels of pupil attainment and (where the data was available) progress over the past three years.
Good-to-great	Schools that are already doing well overall and in science, but are ambitious to develop even better science teaching and learning in their school and were using science to help them achieve this.	We selected schools that had been judged good by Ofsted and had sustained this or been judged outstanding, and had secured improvements in pupil attainment and (where the data was available) progress over the past three years.
Building the foundations	Schools that were aiming to put in place the building-blocks of a new and effective approach to science teaching and learning, and were accessing science CPD in order to do this.	We selected schools that had been judged to be less than good and had achieved an improved Ofsted judgement, and had secured improvements in pupil attainment and (where the data was available) progress over the past three years.

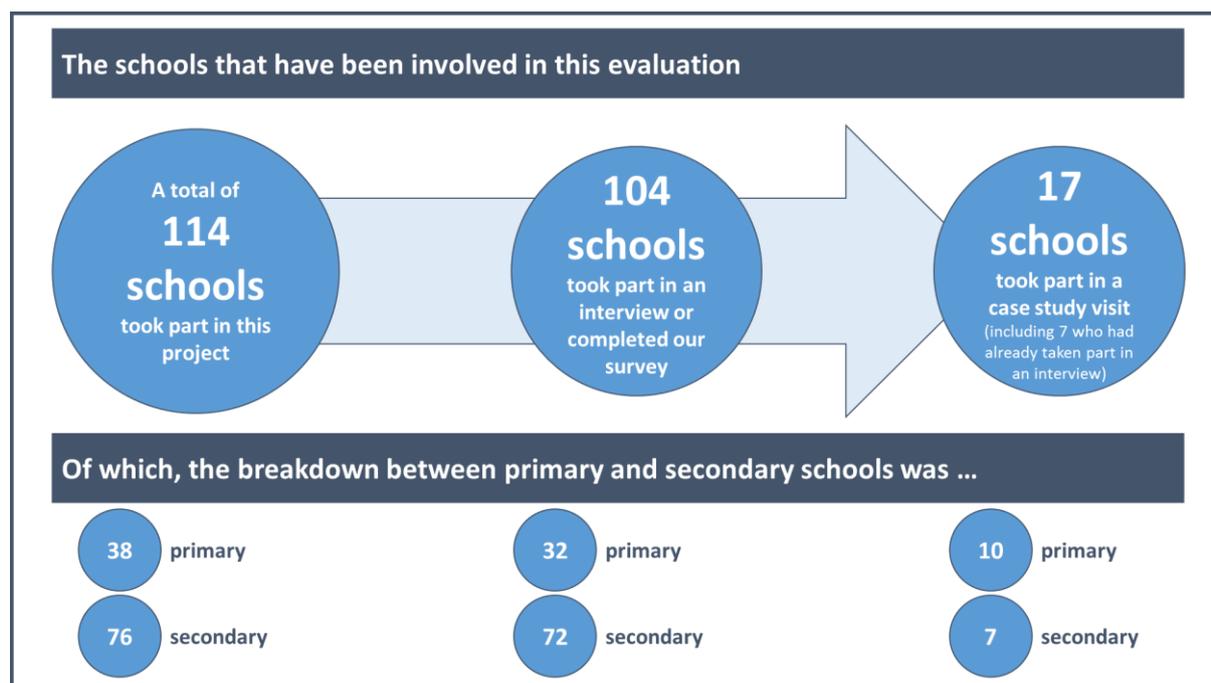
We identified a total of 36 schools that fitted these criteria (24 primary schools and 12 secondary schools). Like the telephone interviews and the survey, participation was completely voluntary and we recognised that not all schools would be able to spare the time to host us on a short visit to the school. A total of 17 schools agreed to take part in a case study visit – seven of these were schools that had taken part in an interview with us already, and 11 were schools we identified through our updated data analysis. Of the 17 schools we visited, 10 were primary schools and seven were secondary schools.

On each visit, we interviewed the school leader, subject leader, and teachers and technicians that had taken part in or benefited from science CPD from the Network. In most instances, we also had the opportunity to speak to a group of pupils about what they were learning in science and other STEM-related activities, and the difference this had made to their learning and how they thought about science.

We captured the learning from these visits in a short case study describing the school’s overall approach to science CPD and the difference the CPD they had accessed from the network has made. These case studies are available in full in the document that accompanies this report. We have also highlighted specific aspects of these case studies in shorter snapshots that are included throughout this report.

A total of 114 schools have taken part in this project. Figure 3 (below) shows the number of schools that took part in each phase of the project.

Figure 3: Schools that took part in the evaluation



As a final stage in the evaluation, and to inform this report, we updated the data analysis we did at the start of the project – exploring connections between usage of CPD from the Network and impact in the classroom. We used the latest data on schools’ use of CPD from the Network and the 2014 data in the National Pupil Database. We triangulated this analysis with the evidence that we had gathered through our interviews with subject leaders, our survey, and our case study visits, and used this as the evidence-based from which to construct this report.

The next three chapters describe our findings in detail. Chapter 1 explores the evidence of the impact of the Network’s CPD at a range of levels within schools. Chapter 2 explores how the schools that took part in this project maximise the impact of the science CPD that they access. Chapter 3 explores the connections between the types of CPD schools access and the ways in which they might be connected. The final, concluding chapter of this report then draws together what we have learned from those schools and highlights what they suggested were the most important lessons and implications in using science CPD to improve science teaching and learning for school and subject leaders, teachers and technicians, and providers of CPD such as the Network.

We have been privileged to have heard from a range of schools about how they have sparked curiosity and inspired young people’s learning, as well as their reflections on what other schools could learn from their experience. We hope that this report is a useful summary for all educators who are involved in improving science teaching and learning in schools across the country.

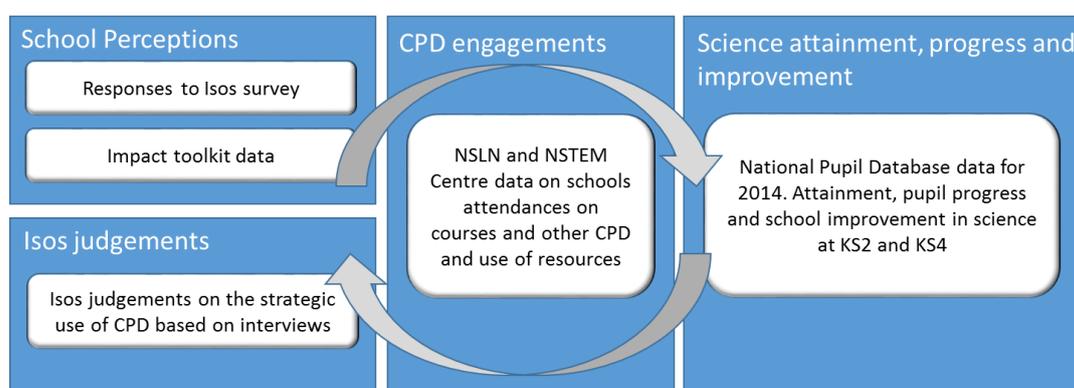
Chapter 1: What impact do schools achieve from using CPD from the National Science Learning Network and the National STEM Centre?

In carrying out this research we have been tasked with exploring:

- what evidence there is to describe and evaluate the impact that science-specific CPD, offered through the Network and the National STEM Centre, has on staff and pupils;
- what factors might influence the degree to which that impact is realised; and
- whether it is possible to define a group of 'strategic user' schools that use science-specific CPD in such a way that its impact is consistently maximised.

In this first chapter of the report we bring together five different types of data to interrogate the first question on the impact that Network CPD has on staff and pupils. These are described in the diagram below.

Figure 4: The five types of data that we have used



The following pages in this chapter explore whether the schools that have benefitted from the Network's CPD have seen an impact on their staff and pupils and the extent to which schools' perceptions of impact are corroborated through national performance data. We also consider whether the data support the hypothesis that schools that are more strategic and planned users of science-specific CPD are more likely than other schools to see a positive impact.

Do schools believe that the Network's CPD has an impact?

Between September 2014 and March 2015, we contacted 151 primary schools, 18 all-through schools and 398 secondary schools (including one middle school deemed secondary) to invite them either to carry out a short telephone interview with us or complete an online survey. The schools were distributed across the country and exemplified a broad spectrum in terms of performance. All the schools were selected because they were reasonably high or high users of CPD from the Network. In total, 59 schools agreed to take part in an interview and a further 45 completed our online survey.

We asked all of the schools that responded to our survey or took part in an interview to rate the impact of CPD in their school on a scale of 1-4, where '1' was very high and '4' was very low. We asked them specifically to rate the impact in relation to:

- participants in the CPD (motivation and confidence, knowledge and skills, practice, quality of teaching);
- their direct colleagues (knowledge and skills, practice, quality of teaching);

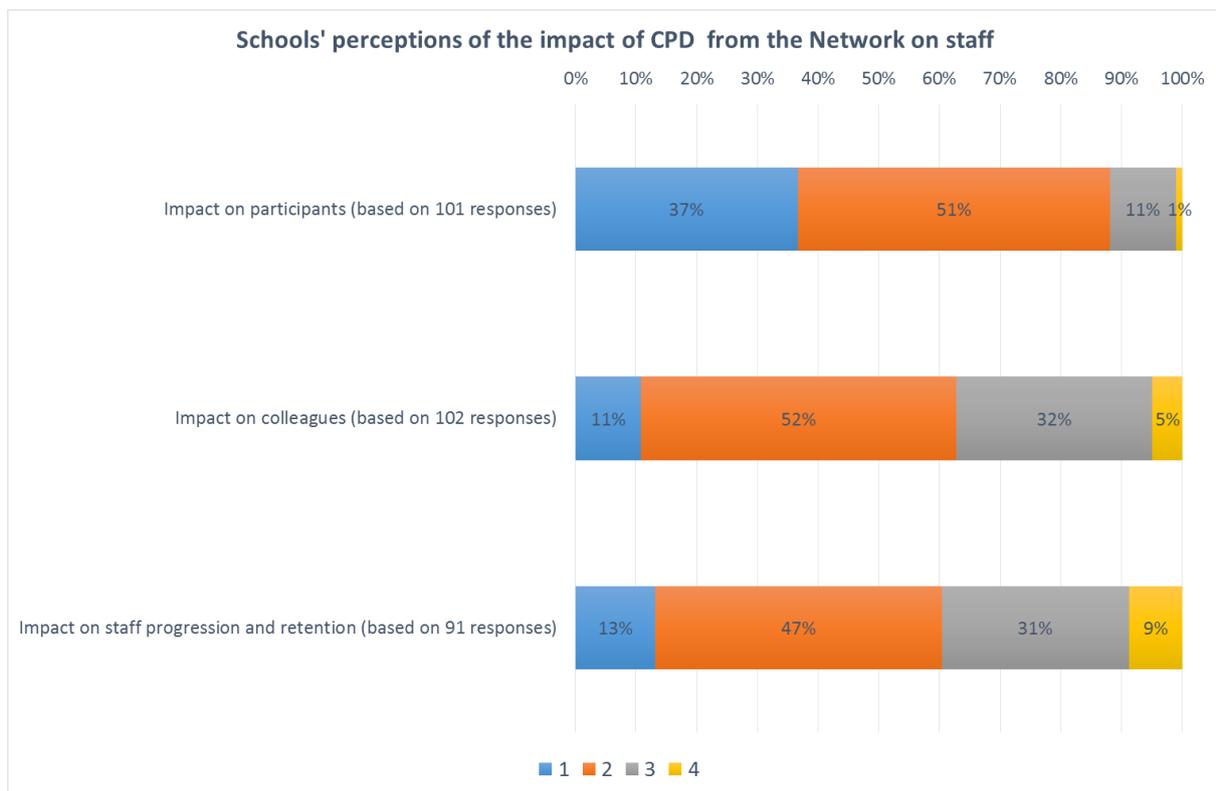
- science staff progression and retention;
- pupils (engagement, mastery of specific skills, achievement and progress); and
- other schools with whom they work.

The following analysis of schools’ perception of impact is drawn from these data, and triangulated with evidence of impact collected by the Network through the impact toolkit returns.

Schools’ perceptions of the impact on staff, their school and other schools

The science leaders we interviewed, or who took part in our survey, were overwhelmingly positive about the impact that Network’s CPD had on those staff who were direct participants. As illustrated in the chart below, 88% of science leaders who responded said that they had seen a positive impact on the staff who had taken part in the CPD, either in terms of their motivation, their knowledge and skills or their quality of teaching. This comprised 37% who answered ‘1’ or ‘very high’ to our question on impact and 51% who answered ‘2’ or ‘high’. There were not big differences between primary and secondary schools in how this question was answered. The results of our small scale survey compare favourably with the outcomes of the 2013 Teaching and Learning International Survey (TALIS), led by the Organisation for Economic Co-operation and Development (OECD), which found that 50% of teachers in England considered the CPD that they had undertaken in their subject fields to have been effective in improving their teaching practice, compared with an average of 71% of teachers in high-performing countries.

Figure 5: Schools' perception of the impact of the Network CPD on staff



These data tells a very similar story to the national and regional evaluation evidence collected by the Network, and also corresponds with the positive picture captured through our review of related research which is summarised briefly in the introduction to this report. For example, between January and May 2015, 61% of those who participated in the Network’s CPD and completed their impact

toolkits reported that the impact on themselves as practitioners had been high, and a further 35% reported some positive impact.

Typically it was the enthusiasm, confidence and motivation of staff that the science leaders whom we interviewed first cited when describing the impact that CPD had on those who took part. Many heads of department and subject leaders said that they saw staff returning from CPD “buzzing” and that they demonstrated a renewed excitement about their subject area and an increased willingness to try new things. Moreover, science leaders were confident that there was a strong link between increased enthusiasm and better quality, more engaging, teaching.

Leaders of science also highlighted the impact that the Network’s CPD had in imparting science-specific knowledge. This was seen to be particularly valuable for teachers who were not science specialists or teaching outside subject specialism, for teachers or technicians responding to curriculum or exam syllabus changes, and for specialist science staff keeping abreast of cutting-edge new developments in science or expanding their knowledge and skills in a niche or technical area.

In some cases, heads of department were able to track the link between a particular Network CPD opportunity and specific changes in classroom practice. This tended to arise where either the CPD the school had accessed from the Network had been chosen to address a particular knowledge or skills gap which subsequently improved, or where the learning from the CPD became a focus in lesson planning and structure more widely across the department or school. Many heads of science said it was more likely that science CPD would result in changes in classroom practice if there were specific strategies that could be derived from the CPD and then translated to a variety of classroom settings. Some of the more common positive changes in science pedagogy described as a result of teachers attending Network CPD were more enquiry-led approaches to teaching and more systematic use of practicals to explain scientific concepts.

The majority of respondents said that the positive impact from Network CPD was sustained over time where changes to teaching practice had been achieved. One head of science described how teaching a good lesson can be ‘infectious’. Unsurprisingly, respondents stated that, in general, the impact of science CPD was much less likely to be sustained when changes in teaching practice were superficial, where teachers had not been inspired to think differently about their practice, or where there was little subsequent support within the school setting to make changes, try new things and evaluate their impact. These comments related to CPD overall, not just Network CPD.

Equipping staff to lead cutting-edge science teaching and learning

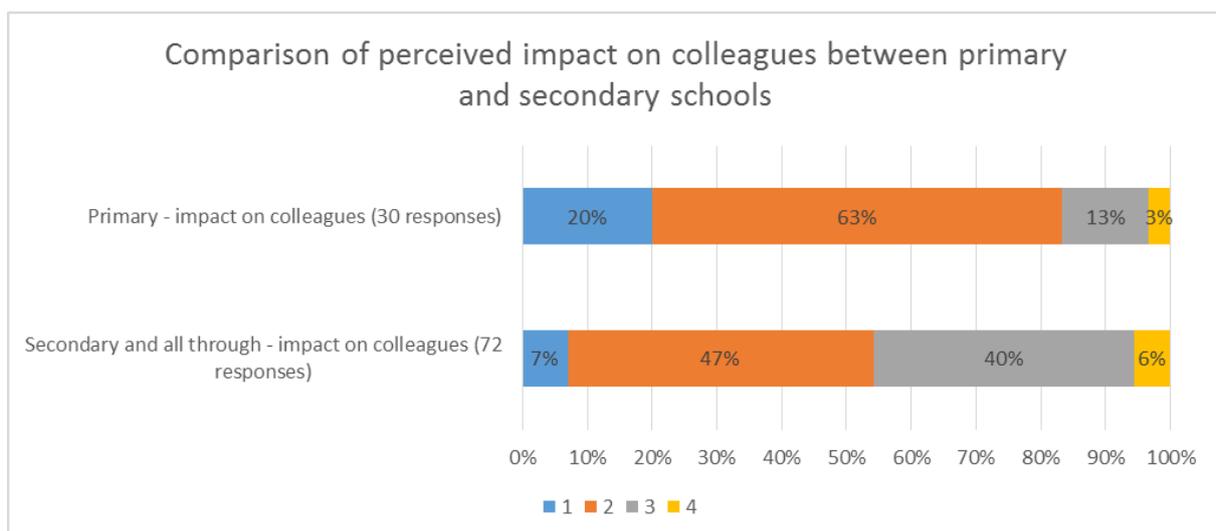
Following the end of standardised KS2 science tests, **Hutton Rudby Primary School** in North Yorkshire developed a new approach to ensure that they continued to offer the highest-quality, cutting-edge science teaching. The role of the science co-ordinator was divided between KS1 and KS2, and the school used CPD to develop the science co-ordinators’ specialist subject-knowledge and embed new ideas in science teaching. Staff described the positive impact of the National Science Learning Network CPD on their confidence and practice. Senior leaders have seen staff become more confident in facilitating hands-on, pupil-led science investigations. Staff also thought the encouragement to keep pace with cutting-edge developments in science teaching was good for staff retention and development. One said, ‘you are always aiming for and working towards something new.’ Another said, ‘through the CPD, my knowledge in the delivery of science has been enhanced, I am more confident and enthused. And if teachers have that enthusiasm, that love of the subject, the pupils pick up on that. They just love science!’

Through our survey and interviews, we asked leaders of science to assess the impact of the Network CPD, not just on those who had directly participated but also their colleagues. Their answers are also reported in figure 5. Overall, 63% of science leaders responded that there had been a clear positive impact from the CPD undertaken on the colleagues of those who attended. The extent of impact is therefore not as high as for those who had taken part themselves, but that is not surprising. It is still encouraging that almost two-thirds of respondents saw that the positive impact of the CPD had spread beyond the direct participants to have a wider benefit to colleagues in the department or the school. In comparison, 77% of teachers who completed their impact toolkit returns reported that the Network CPD they had undertaken had made a positive impact on their colleagues through the sharing of effective practice and resources, and 48% stated that there had been an improvement in their colleagues' quality of teaching. The slightly higher level of reported impact from the impact toolkit returns may reflect the fact that this is based on *participants'* impression of impact, whereas our survey was based on *subject leaders'* views. Each is likely to bring a slightly different perspective to the question.

Our survey evidence suggests that there is a clear link between the strength of the expectation within a school that the outcomes of science CPD will be shared and the impact that Network CPD has beyond the direct participants. All of the 64 science leaders who answered '1' or '2' to the question '*What impact from Network CPD have you seen on the colleagues of those who attended?*' also responded '1' or '2' (very high or high) to the survey question '*How much expectation is there that staff will share their learning with their colleagues formally and use this to shape department-wide practices?*'. In contrast, over a third of those 38 science leaders who replied '3' or '4' to the question on the impact on colleagues also responded '3' or '4' to the question about sharing learning.

In general, primary schools were more positive about the impact that Network CPD had on the colleagues of those that took part than secondary schools. Although small numbers mean we should be wary of comparisons, as figure 6 (below) shows, 83% of primary science leaders responding thought that the impact on colleagues was high or very high compared with 54% of secondary science leaders.

Figure 6: Comparison of perceived impact – primary and secondary schools



Many of the primary science leaders that we interviewed expressed very strong expectations that individuals accessed science CPD as a representative of the school, and would be expected to cascade actively their learning on their return. In some cases the science lead themselves undertook the bulk of the science CPD, and then had an explicit responsibility for disseminating this to others and coaching

staff in how to apply the CPD in day-to-day lessons. In a primary school, while there may be fewer science experts, every teacher has a responsibility for teaching science and it is therefore likely that any science CPD undertaken will have whole-school relevance. These variations in culture and approach to disseminating CPD may help explain the different perceptions between the phases.

This finding is corroborated by some of the evidence from previous evaluation studies. For example, Judith Bennett et al's 2010 research, *The impact of targeted continuing professional development*, suggested that the 'implementation space' (i.e. how CPD is shared and embedded) was different in primary and secondary schools, due to the different management and staff structures and different proportions of staff with specialist subject-knowledge. Consequently, there was more likely to be an impact on teaching practice beyond the classroom of the immediate CPD recipient in primary than secondary schools.

In both phases, where schools were most confident about the impact that Network CPD had beyond the individual participant, it was often because the CPD was planned to address a whole-school or department development need and had become the foundation for an ongoing improvement process. Some schools had used Network CPD strategically to help implement a wholesale change in teaching practice over a significant period of time. Other schools had used frameworks like the primary science quality mark, although not part of the Network, as a vehicle for whole school improvement. A small number of schools were able to describe a strategy for cascading CPD over a number of years. This started with science leadership CPD for the head of department or science co-ordinator, then targeted expert teachers with specific skills, and then looked to distribute learning more widely across the whole staff group. In those schools, leaders of science were very clear about how the learning was shared and how the impact was felt in all different parts of the school.

Through our survey and interviews, we also asked schools to evaluate whether the CPD they had accessed from the Network had made a positive impact on staff progression and retention. In general this was a question that science leaders found harder to answer than many of the other impact-related questions. Indeed, over 10% of those we asked felt unable to comment. Some of those who were not able to answer this question had been in post a relatively short time, and during that period none of the wider science team had been promoted, changed roles or considered leaving the school.

Nonetheless, 60% of those who responded stated that engaging in the Network's CPD had made a strong or very strong contribution to better career progression or retention for staff in their school. Often those schools that were able to describe most confidently the impact of science-specific CPD on staff retention and progression had linked the selection and following-up of CPD into the staff appraisal process. That helped to make the expectation of progression, and how it might be supported through planned engagement in science CPD, more explicit.

There were different manifestations of this, depending on the level of experience of the participant in the CPD. We heard evidence of schools using a systematic programme of CPD from the Network for newly-qualified teachers (NQTs) and less experienced teaching staff in order to equip them with a foundation of core skills and science knowledge. Some of those schools, such as Altrincham Grammar School for Girls (see the vignette below) attributed their success in recruiting and retaining staff, such as NQTs, to their proactive approach to CPD. At the other end of the spectrum, some science leaders, for example leaders at Southend High School for Boys, astutely used the opportunities afforded by engaging in highly-specialist CPD as a way of continuing to engage, motivate and inspire very experienced teaching staff and keep their love of the subject alive. Some subject leaders who were new to head of department or science co-ordinator roles also spoke very convincingly about the

contribution that the CPD they had accessed from the Network had made in enabling them to step into a position of higher responsibility and, importantly, to make a success of it when they got there.

Using CPD to recruit and retain excellent science teachers and technicians

Staff at **Stephenson Memorial Primary School** in North Tyneside describe the way in which the school values CPD, invests in its staff and enables them to progress. School leaders describe the impact their approach to investing in CPD has had on staff, and how it has been key to the retention and progression of high-quality science teachers. As one school leader put it, 'we have low staff turnover, but high leadership capacity.' In a different part of the country and a different school phase, **Altrincham Grammar School for Girls** in Trafford has adopted a similar approach. They have found that investing in CPD has enabled them to demonstrate to prospective and current staff that the school values the long-term professional development of their staff, which in turn has had a knock-on effect on the school's ability to recruit and retain talented science teachers. **Exeter Road Primary School** in Exmouth and **Millais School** in West Sussex also reported impact on the retention and progression of current and aspiring science teachers, particularly where the Network CPD they have accessed was specifically related to developing a member of staff's leadership or role-specific skills.

Despite the considerable positive feedback about how CPD from the Network has contributed strongly to staff progression and retention, this was also an area where a relatively high proportion (9%) of respondents said that the impact was weak. Often these were schools where other external factors, such as change of status or leadership, poor Ofsted results or financial difficulties, were leading to a situation in which either retaining staff or enabling them to progress was proving extremely challenging. In such circumstances it was suggested that other countervailing pressures were negating any positive impact that engagement in science-specific CPD might have had in other circumstances. Other schools that deemed the impact to be weak were at the other end of the spectrum – they described a staff base which was exceptionally stable but could not ascribe that stability to any great extent to engagement in science-specific CPD.

Our review of previous evaluations, in particular Claire Wolstenholme et al's 2012 research, *The Impact of Science Learning Centre continuing professional development on teachers' retention and careers*, and Ofsted's 2013 report, *Maintaining Curiosity*, suggested that secondary schools were more likely to see an impact on career progression outcomes as staff typically have a greater range of roles into which they can progress, and primary schools were more likely to see an impact on teacher confidence, as fewer teachers are likely to be science specialists. The results of our survey do not fully corroborate this. Again, one must be cautious about extrapolating too much from small numbers, but 67% of primary respondents answered that the impact on progression and retention was strong or very strong, compared with 58% of secondary respondents. There were, however, some differences that emerged from the interview data on how the different phase subject leaders reflected on this question. Although it is a generalisation, secondary schools were much more likely to link the choice of CPD to an individual's performance appraisal than primary schools' whose CPD choices were more closely linked to whole school development priorities. Consequently, in talking about the impact on career progression and retention, secondary schools, on the one hand, were more likely to reflect on the science teaching career paths of those individuals who had taken part in the CPD. Primary schools, on the other hand, were more likely to reflect on how science CPD contributed to a holistic approach to learning within the school and a sense of staff being valued, which in turn contributed to good staff retention.

Lastly, we asked subject leaders about whether the CPD they had accessed from the Network had had an impact on other schools with whom they worked. It was telling that the most common answer given (by one in three subject leaders) was ‘not applicable’: many described how they did not work with other schools to share science CPD learning and teaching practices, and therefore could not comment on impact. Interestingly, primary schools were more likely to report a ‘high’ or ‘very high’ level of impact (43%) than secondary schools (13%), and were less likely to say ‘not applicable’ (28% of primary school subject leaders compared 35% of those in secondary schools). Of the 20 schools which stated that the impact of their Network CPD on other schools was high or very high, a quarter were rated outstanding by Ofsted and two of these played a lead role in local teaching school alliances. There were also three schools from the North Tyneside area, which has a very active, collaborative North Tyneside Learning Trust in place, which also includes an area-wide science learning partnership.

As we describe in chapter 2, the more strategic users of the Network’s CPD were more likely to be involved in partnerships and networks, such as science learning partnerships, teaching school alliances, PSQM networks or less formal collaborative arrangements, through which they could share subject-specific learning, including science. In most of these instances, the evidence of impact reported to us was on the confidence, knowledge and skills of teachers and technicians, rather than direct evidence of learning in the classroom.

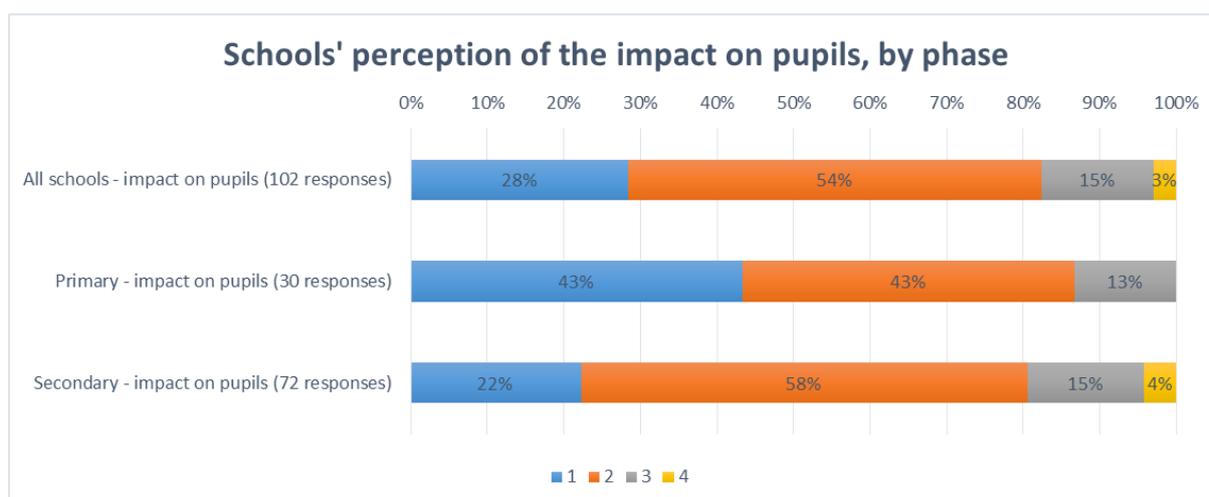
Partnership-working to support high-quality science teaching and learning locally

South Farnham School in Surrey aims to develop members of staff to act as leaders on particular curriculum areas. A key part of this is the subject-specific joint practice development they do as part of a confederation of ten local primary schools and disseminating effective new science teaching through the teaching school alliance it leads. Other primary schools, such as **Duddon St Peter’s Primary School** in Cheshire, **Tower Road Academy** in Boston, **Exeter Road Primary School** in Exmouth and **Winterbourne Earls Primary School** in Salisbury, were involved in leading the development of new approaches to assessment in science and sharing science learning in local primary clusters or as part of local Network science learning partnerships. What these schools had in common were two things. First, they saw that these opportunities for teachers to lead CPD had a significant impact on those teachers’ teaching practice. Second, they enabled the schools to pick up what one teacher referred to as ‘little gems’ of feedback from other schools that could be used to further improve their own practice.

Schools’ perceptions of the impact on pupils

The very large majority of schools (82%) that took part in our survey or interviews reported that the impact that Network’s CPD had on pupils, in terms of their engagement, mastery of specific skills, achievement or progress was either high (54%) or very high (28%), as shown in the chart below.

Figure 7: Schools' perceptions of the impact on pupils – primary and secondary schools



This is a very encouraging finding. It is reinforced by evidence from the impact toolkit returns which show that 79% of those responding stated that there had been ‘great’ or ‘some’ impact on pupils.

Some of the positive effects on pupils that science leaders frequently described included:

- increased excitement and engagement in science lessons, often as a result of more interactive and practical-based teaching strategies;
- improvements in pupils’ inventiveness, enquiry and investigative skills; and
- enthusiasm for an increased range of extra-curricular science activities.

Investigative approaches

The development of a more investigative, pupil-led and hands-on approach to science has clearly enthused pupils at **South Farnham School** in Surrey. Pupils across the year-groups spoke of their interest in finding out how things work, how much they were learning because they were able to discover things for themselves, and how this made them want to share what they had learned with other students and their families. As one Year 6 pupil said, ‘I like it when we get to do things, not just get told. It makes you want to learn, helps you to remember and implants it in your brain.’

Pupils spoke excitedly about what they wanted to learn about and how this might influence their future study and career choices. There was at least one budding science teacher, with very clear ideas about how to maximise learning. This Year 5 pupil said: ‘I would like to teach science. I really enjoy it as a subject. I think other people would enjoy it too if it was taught the right way – when you don’t just sit on the carpet and get told things, but you get to investigate and experiment.’

Similarly, pupils at **Hampden Gurney Primary School** in Westminster are encouraged to ‘think like scientists’. Pupils spoke excitedly about the different experiments they had done in class, at home, and that take place in the school’s popular weekly science club. They also spoke animatedly about some of the ways they had thought about the experiments they had done, how this had prompted them to think of other scientific ideas they would like to investigate, and topics they would like to study at secondary school.

The importance of science learning beyond the classroom is worth reflecting on further here. A number of schools, including some of those we visited as case study schools, emphasised the role that after-school or lunchtime science clubs played in enabling science teachers returning from science

CPD to try out new teaching techniques or explore different scientific topics in a low-risk environment. This, in turn, inspired and engaged pupils, exposed them to the wider possibilities of science and opened up creative pathways that could feed back into science lessons.

Enthusing pupils with a passion for STEM outside the classroom

At **Stephenson Memorial Primary School** in North Tyneside, it is not only the staff who are empowered to be leaders – older pupils have the opportunity to become STEM ambassadors, which involves supporting young pupils to perform experiments during STEM activities and demonstrating experiments to other pupils and parents during the school’s annual STEM fair. Likewise, **Ormiston Maritime Academy** in Grimsby has seen a growing interest in STEM-related enrichment activities. Students spoke in glowing terms about their weekly STEM club, in which they were currently developing a prototype of a universal games console. One student described what the STEM club does and why they joined STEM club: ‘We learn stuff that other people do not know. I joined STEM club because I love every part of STEM – science, technology, engineering and maths. I love building things.’

A second striking feature of the data presented above is the very positive responses that primary subject leaders gave on the impact on pupils. Broadly speaking, similar proportions of primary and secondary schools reported a high or very high level of impact (82% primary, 80% secondary), but primary schools were nearly twice as likely to report very high impact on pupils – 43% said that the impact was very high.

Our interview evidence provides some clues as to why these phase differences emerge. Overall, primary subject leaders were more likely than their secondary counterparts to base their judgements on their observations of pupils’ enjoyment of science – their motivation to learn and excitement in discovery. Secondary science leaders tended to be more tentative in evaluating impact, with a greater focus on what they could evidence through better pupil progress or examination achievement. While some secondary science leaders were confident in describing the contribution that CPD from the Network had made (along with other factors) to increasing science results over a period of time, others were more hesitant about positing a causality that they could not prove.

As described below, a number of secondary schools we visited also described the impact they had seen on rates of students taking triple science at Key Stage 4 or indeed going on to study science subjects at Key Stage 5. Crucially, in each case, the Network CPD that the schools reported had contributed to this impact had been selected deliberately with these aims in mind. This further reinforces the point that clarity about expected impact when selecting CPD is a crucial ingredient in achieving and being able to evidence that impact afterwards. A small number of schools commented that it was helpful where a discussion of expected impact was built into the CPD itself.

Students being inspired to study science

Several of the secondary schools that we visited described how they had growing numbers of students wanting to study science. At **Maria Fidelis Roman Catholic Convent School** in Camden, a big focus of the CPD they have accessed from the Network has been triple science. In terms of impact, three years ago no students took triple science at the school; last year, every student that did undertake triple science received three good science GCSEs. Likewise, **St Gabriel’s Roman Catholic High School** in Bury has remodelled its science curriculum and has seen take-up of triple science increase fourfold to almost half of a year-group. **Ormiston Maritime Academy** in Grimsby and **Altrincham Girls Grammar School** in Trafford have reported ever-growing proportions of pupils, notably girls, choosing to study subjects such as physics when they move on to Key Stage 5.

What was common in each case was that the schools sought to introduce a more investigative, enquiry-based approach to teaching science and have focused on broadening their students' horizons about the opportunities for further study and careers in science.

The differences in the perceived impact on pupils between primary and secondary schools may also be a corollary of the finding, explored in the section on perceptions of impact on staff, that primary schools, on average, appear to be more confident that the impact of CPD is being felt beyond the direct participants. For some of the secondary science leaders we interviewed, their caution around ascribing very significant changes in pupil progress or achievement to science CPD was influenced by the fact that they believed the learning was more “locked in” to the specific pupils taught by the teachers who had attended the CPD, and had not been released to have a wider departmental effect.

Looking across the survey results from schools in both phases, there appears to be an interesting correlation between the degree of impact on pupils perceived by the school, and their confidence that they had been clear why the particular CPD in which their staff had engaged had been chosen. Of those 28 science leaders who answered ‘1’ to the question about the degree of impact, all also answered ‘1’ or ‘2’ to the question ‘*How clear was your school about why it accessed the National Science Learning Network CPD you have accessed?*’. Conversely, of the 18 science leaders who rated the impact on pupils as ‘3’ or ‘4’, eight (nearly half) also rated their clarity about why they had chosen the particular CPD as ‘3’ or ‘4’. The importance of selecting the right CPD, being clear about what the intended outcome should be, and then tracking and evaluating whether that outcome was achieved, is an important component of the effective use of science-specific CPD which is explored more fully in chapter 2.

There was a range of evidence on which science leaders were basing their judgements on pupil impact. The schools that were most confident in describing the impact of CPD on pupil learning tended to have a systematic approach to lesson observation, through which they would consciously and explicitly look for evidence of whether CPD had improved practice and affected learning. This was often reinforced by a culture within the school in which conversations about individual pupils’ progress between different members of staff were commonplace, so that information about teaching techniques which had worked very well for particular pupils or groups of pupils were shared and an understanding of how changes in pedagogy led to a better impact on pupil learning was built collectively. Some schools also had a process of structured feedback in place from pupils, which helped to build an evidence base on how pupils viewed their science lessons and learning. While many schools were confident that CPD they had accessed from the Network had made a contribution to improving results, few science leaders to whom we spoke were able to quantify that contribution with any degree of precision.

Do national data corroborate subject leaders’ perception of impact?

The preceding section shows that the vast majority of subject leaders that we interviewed or surveyed, all of whom were from schools that were relatively high or high users of Network CPD, were confident that the CPD was having a strong positive impact on participant’s practice and on pupil learning. Furthermore, a clear majority of those interviewed or surveyed also stated that the impact of the CPD had spread beyond the direct participants to influence positively the broader staff base and to contribute to improved retention and progression. Science leaders’ perceptions are therefore clear – engagement in the Network’s CPD is having a positive impact in their schools. In this section we

interrogate the national data to explore whether it broadly corroborates schools' views on the impact of CPD.

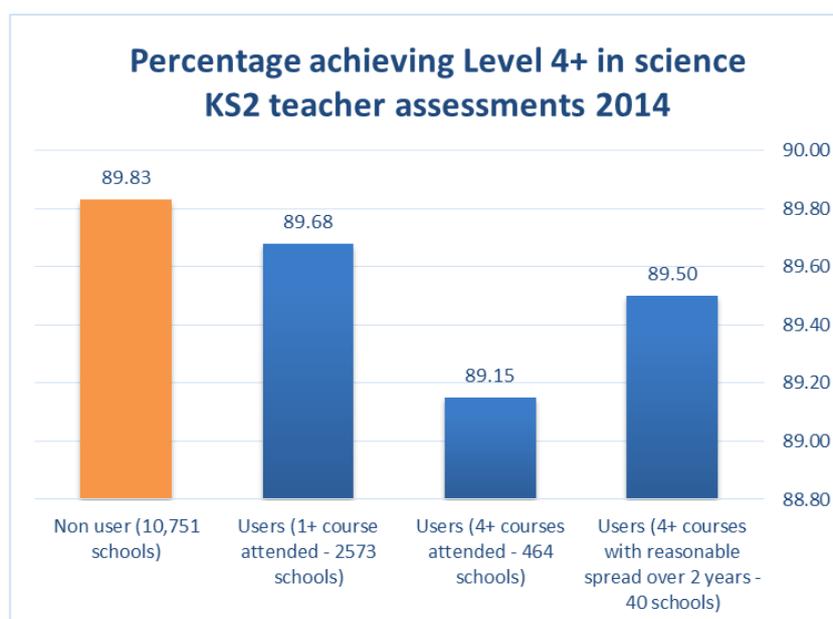
The data collected on CPD engagement by the Network provide information on the number of CPD attendances, the number of different individuals participating in CPD and the number of different courses attended by each school. We have brought this together with data on school achievements in science from the 2014 National Pupil Database to attempt to shed further light on the relationship between carrying out science-specific CPD and the impact on pupils.

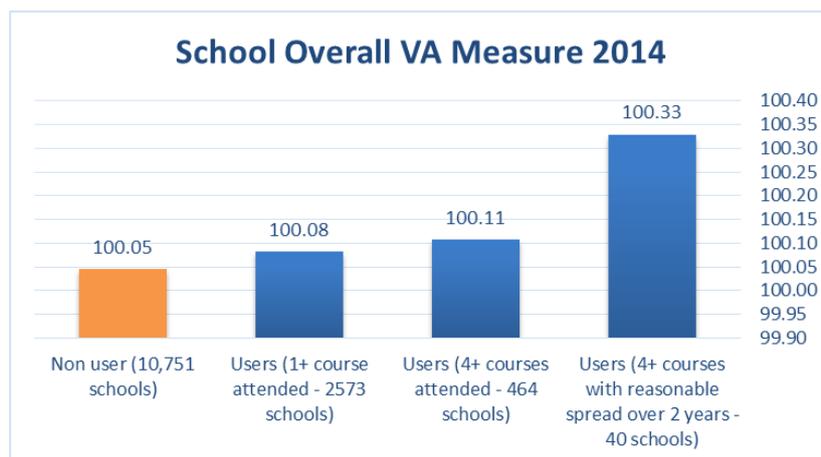
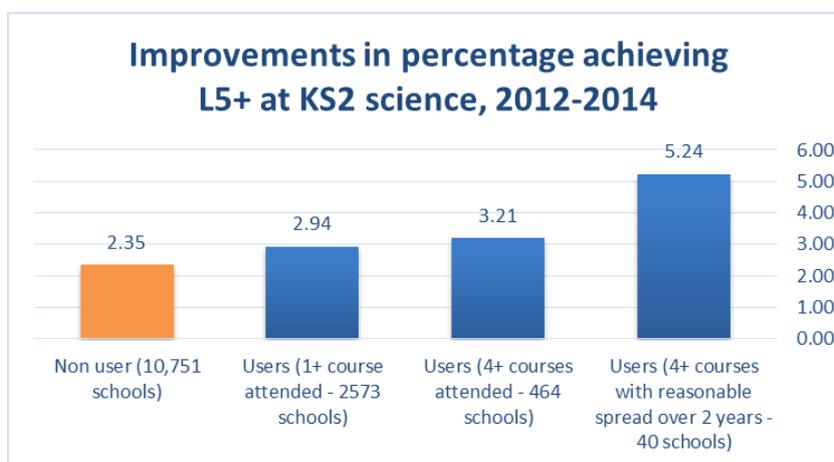
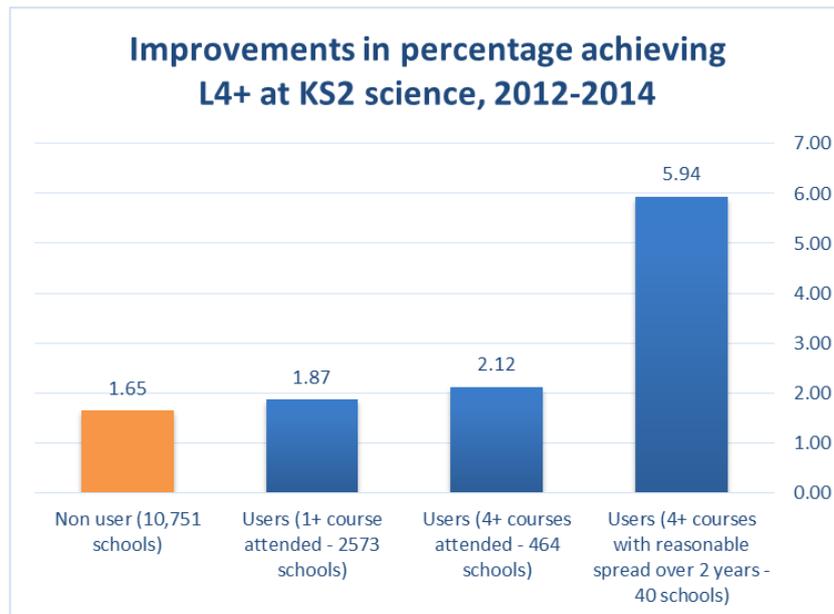
National data on primary schools

Our analysis of the primary phase data suggests that those primary schools that have engaged systematically and to a high degree in the Network's CPD are, on average, starting from a lower base of science attainment than other schools, but are improving more rapidly and show higher value added (VA) than other schools. The improvements in the percentage of pupils achieving L5+ also mirrors the picture for L4+ increases over three years. This is exemplified in the charts in figure 8 (below). They show the relative performance, in terms of Key Stage 2 (KS2) science teacher assessment, three-year improvements in KS2 science teacher assessments, and whole school VA for four groups of schools:

1. primary schools that have undertaken **no Network CPD** between 2012 and 2014 (10,751 schools);
2. primary schools that have engaged in **at least one Network course** between 2012 and 2014 (2,573 schools);
3. primary schools that have engaged in **four or more Network courses** between 2012 and 2014 (464 schools); and
4. primary schools that have engaged in **four or more Network courses regularly over a two-year period** (40 schools).

Figure 8: Performance of primary schools according to their use of CPD from the Network (2012-2014)



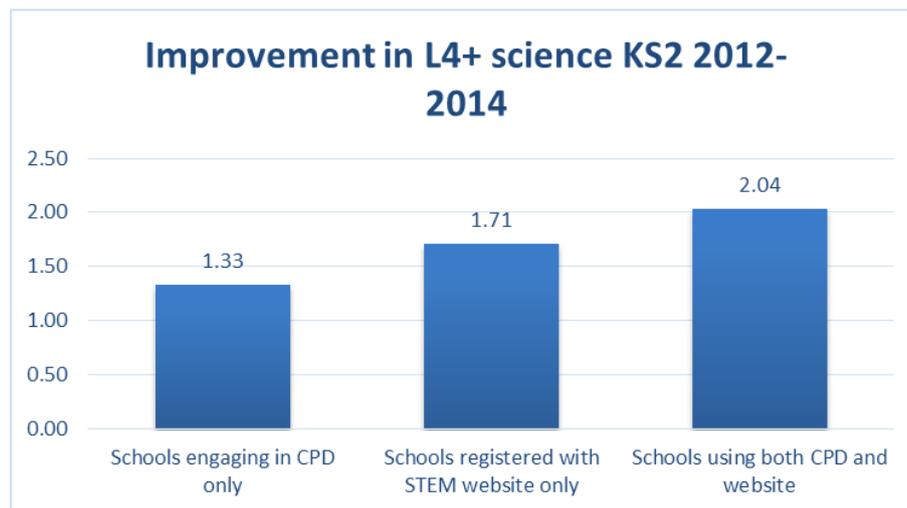


The data strongly suggest that engaging in moderate to high levels of Network science-specific CPD in a planned and consistent fashion across at least a two-year period can lead to benefits in terms of faster improvement and better value added for schools in the primary sector.

We have also looked at whether one type of CPD is likely to lead to greater impact than another type of CPD. The data do not appear to suggest this is the case. Indeed, this finding is itself consistent with the message reported to us during our fieldwork interviews and visits that what matters is that a

school selects the right CPD for them at any particular time. As we explain in chapter 3, this will be different depending on the individual circumstances and improvement priorities of the school. Our data do, however, suggest that schools that combine the use of the National STEM Centre resources with CPD are improving slightly faster in science, and have better value added overall, than those which use either on its own. This is illustrated by the chart below.

Figure 9: Improvement in science attainment in primary schools based on their access to CPD and/or National STEM Centre resources



National data on secondary schools

Our analysis of the secondary phase data paints a slightly different picture to that at primary. The first key difference is that a much larger percentage of secondary schools than primary schools have engaged in CPD from the Network over the 2012-2014 period. As larger organisations, the extent of secondary school’s engagement has been that much greater. Over three-quarters of secondary schools had engaged in at least one Network CPD activity in the three-year period, and the average number of attendances was 4.5. In primary schools, only around 20% had engaged in some CPD from the Network, and the average number of attendances was 1.7.

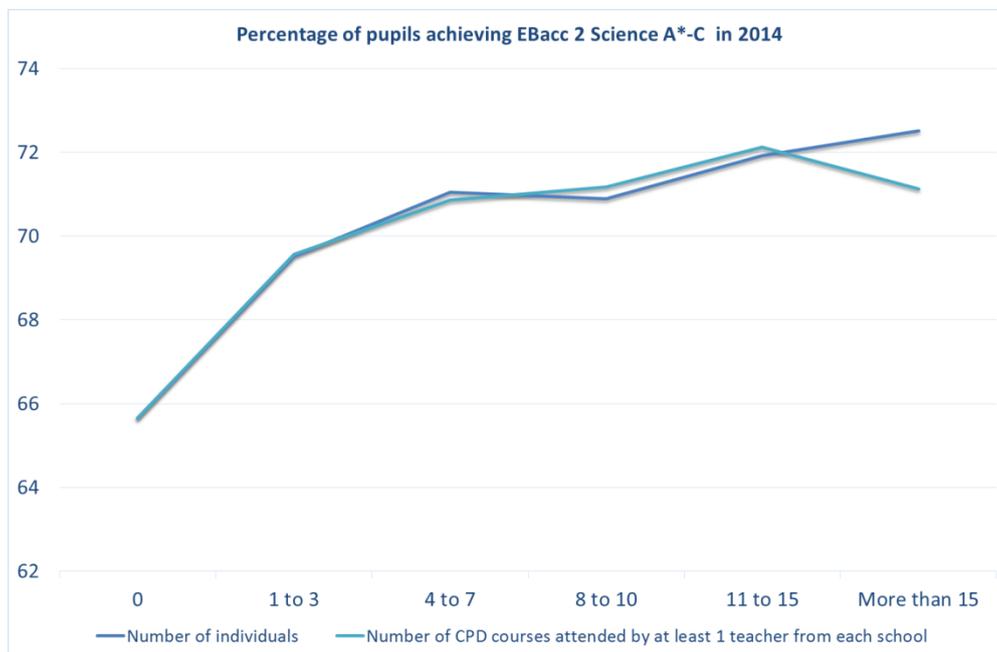
The second key difference is that the number of members of staff taking part in CPD appears to be a more influential factor in the secondary sector than it is in primary. In secondary schools, science departments are frequently large and the extent to which CPD is distributed between staff is relevant. In primary schools there may well be one or, in some cases, two science co-ordinators whose remit include the training of other teaching staff in school.

The third key difference is that in the period in question, 2012-2014, Key Stage 4 (KS4) science examinations have been subject to a far higher degree of change than the Key Stage 2 assessments. This has had a bearing on the extent to which meaningful analysis can be drawn from the two- or three-year trend data.

In contrast to the primary sector, those secondary schools engaging in higher levels of Network CPD appear, on average, to be higher-attaining than those who engage in less or no Network CPD. This may be showing that more successful secondary schools are more likely than schools that are struggling to seek out science-specific CPD. Or it may be that, because the secondary science CPD market is more mature than that in primary, it is those schools that have been engaging in science CPD over a longer period of time that now see the higher attainment results. The backdated time series of data that would be needed to test this hypothesis fully, however, does not exist. Figure 10

(below) clearly demonstrates the correlation between higher levels of use of CPD from the Network and higher levels of KS4 attainment. It shows the average attainment of EBacc 2 Science (A*-C) at KS4 in 2014 for schools in each of six bands according to the number of CPD activities they have accessed.

Figure 10: Secondary school attainment in two sciences (2014) according to their use of Network CPD

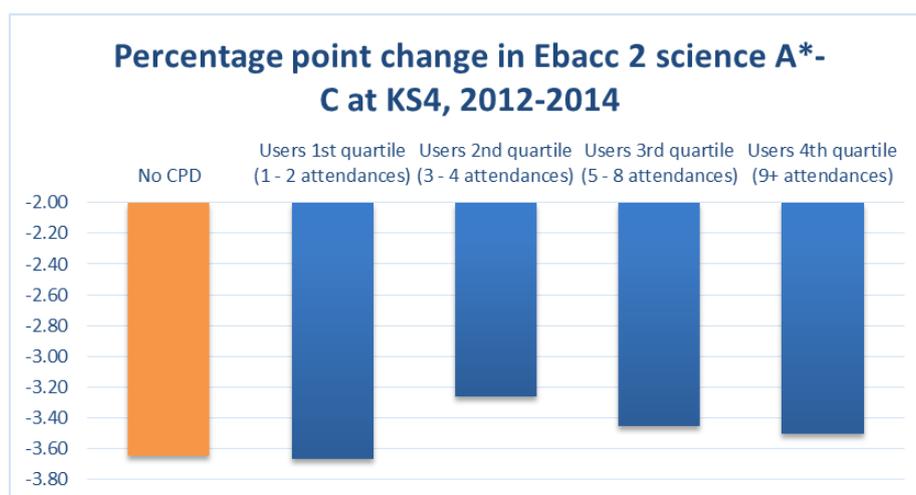


Again, however, in contrast to the primary sector, the data on the three-year improvement trajectory for schools engaging in Network CPD compared with those that have not present a much less clear picture.

Figure 11 (below) includes all secondary schools that have a consistent time series of KS4 results in 2012, 2013 and 2014 reported in the National Pupil Database. It groups these schools according to those that have engaged in no CPD from the Network, and then for each quartile of schools in terms of the number of CPD attendances.¹ The average three-year trend in achieving EBacc 2 science (A*-C) is shown for each group. This clearly shows that, on average, schools across the board, irrespective of their level of engagement in CPD from the Network, have experienced some setback in terms of their levels of attainment in 2014 compared with 2012.

¹ Many schools that became academies during the period in question do not have a consistent three-year time series of results reported in the National Pupil Database because the unique reference numbers for the schools have changed and prior results and CPD attendance data are reported for the previous institution.

Figure 11: Percentage point change in secondary schools' attainment in science between 2012 and 2014

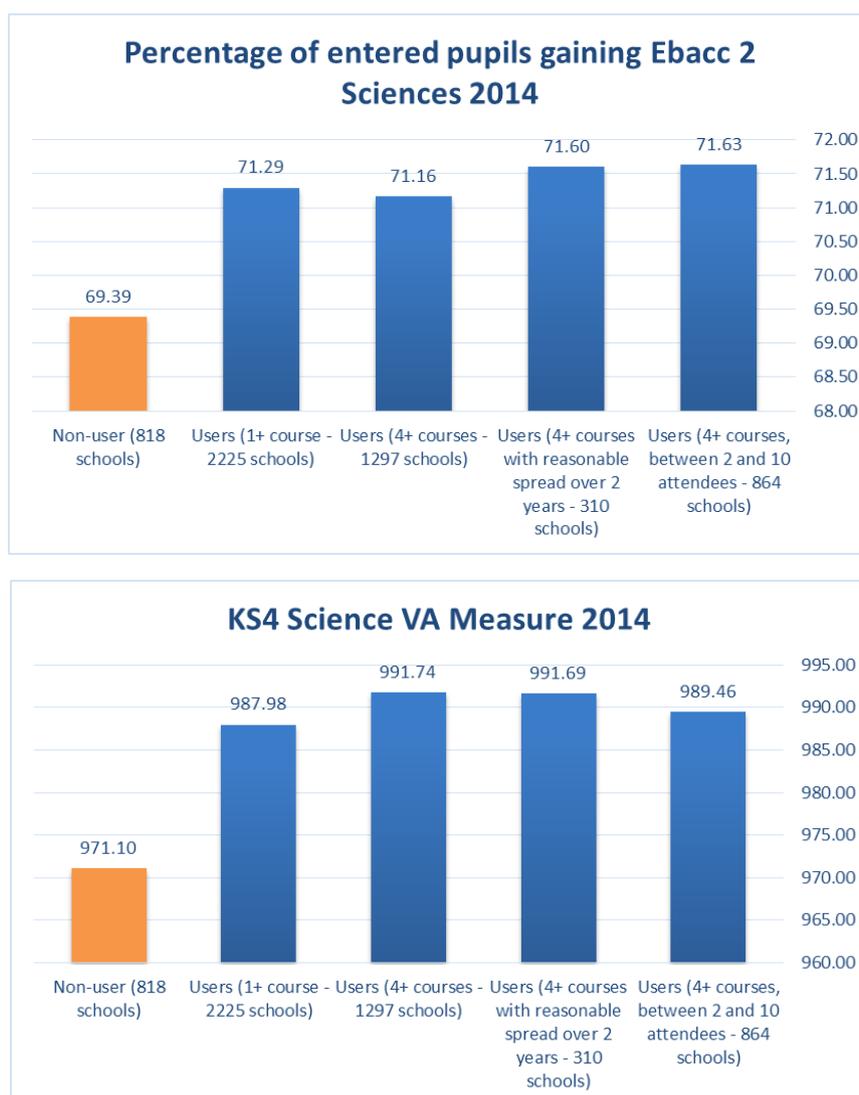


Notwithstanding the difficulties presented by the three-year trend data during this period, an analysis that singles out those secondary schools that are systematically using Network CPD over a number of years offers some interesting conclusions in terms of both attainment and value added in science. Figure 12 (below) shows five groups of schools:

1. secondary schools that have undertaken **no Network CPD** between 2012 and 2014 (818 schools);
2. secondary schools that have engaged in **at least one Network CPD course** between 2012 and 2014 (2,225 schools);
3. secondary schools that have engaged in **four or more Network CPD courses** between 2012 and 2014 (1,297 schools);
4. secondary schools that have engaged in **four or more Network CPD courses** regularly over a two-year period (310 schools); and
5. secondary schools in which between **two and 10 members of staff have engaged in a total of four or more Network courses** (864 schools).

These charts show that those secondary schools that are engaging in a moderate to high level of CPD from the Network systematically over the period are achieving higher percentages of pupils attaining EBacc 2 sciences A*-C at GCSE, and are achieving a higher VA score in science. Interestingly, it also seems to be the case that distributing the learning between a minimum of two and a maximum of 10 people has a beneficial impact on both these measures. For secondary schools, however, it is the difference between users of Network CPD and non-users which is most striking, rather than the particular pattern or extent of CPD usage over the period.

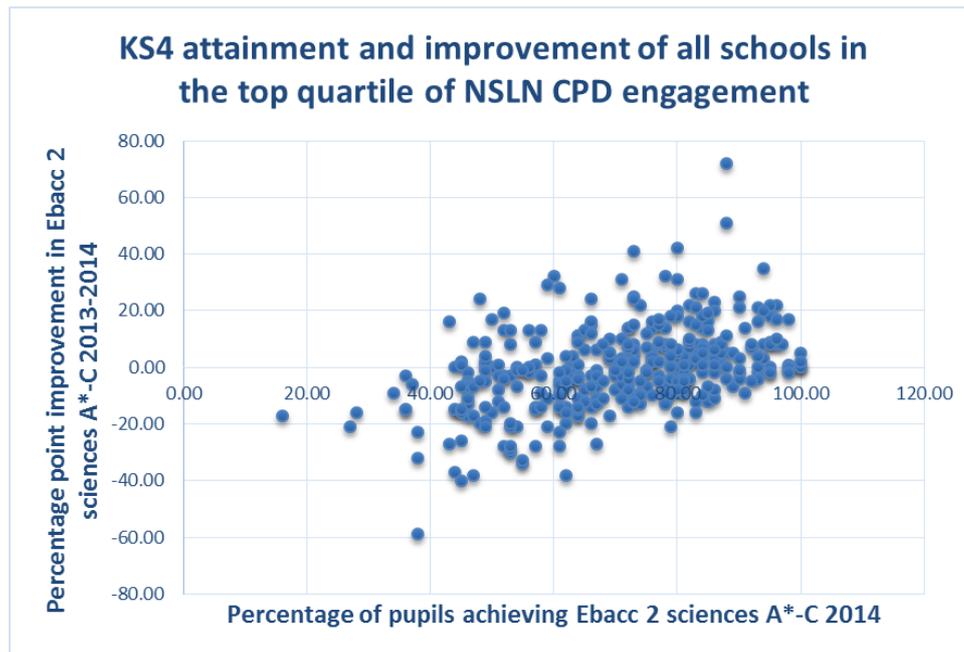
Figure 12: Performance of primary schools according to their use of CPD from the Network (2012-2014)



As was the case in the primary sector, our analysis of different types of CPD did not suggest that choosing one type of course over another, on average, led to any substantial or consistent differences in impact. Like primary schools, however, it was the case among secondary schools that those schools that engaged in CPD courses *and* were using National STEM Centre resources saw higher levels of VA in science than those schools using either the CPD or the resources in isolation. Secondary schools which used both CPD and STEM centre resources also saw higher levels of attainment in science than schools using either resource on their own.

The picture painted by the analysis above is a positive one, and supports the conclusions on the impact of CPD reached by those science leaders that took part in our research. Specifically, our analysis suggests that, on average, moderate to high engagement in Network CPD appears to lead to higher levels of VA in both primary and secondary schools, higher rates of improvement at primary, and higher levels of attainment at secondary. It is, however, too simplistic to say “doing more science-specific CPD leads to higher levels of impact”. The averages quoted in the analysis mask the huge levels of variation between schools that have accessed similar quantities of CPD from the Network. The chart below, which shows KS4 attainment and 2013-2014 KS4 improvement (Ebacc 2 sciences A*-C) for all schools in the top quartile of use of Network CPD demonstrates the massive range.

Figure 13: Attainment and improvement of secondary schools in the top quartile of use of Network CPD



The picture this presents is unsurprising: every school will be subject to a unique context, and the different pressures and opportunities this presents. Nevertheless, it begs the question of whether it is possible to identify factors that make it more likely for any given school that engaging in CPD from the Network will lead to the desired impact. This is an important question for this research.

Is there evidence that more strategic users of Network CPD achieve a greater impact than less strategic users?

Our review of past evaluations of the use and impact of science CPD suggested that there were a set of approaches to the planning, embedding and evaluation of CPD that can dramatically influence the extent to which the CPD will have an impact on pupil learning.

As described on in the introductory chapter, and set out at Annex B, we developed an evaluative framework against which to compare the approaches of those schools to science-specific CPD in a consistent way. For each of the 59 schools we interviewed we made three separate judgements, on a scale of 1-4, for:

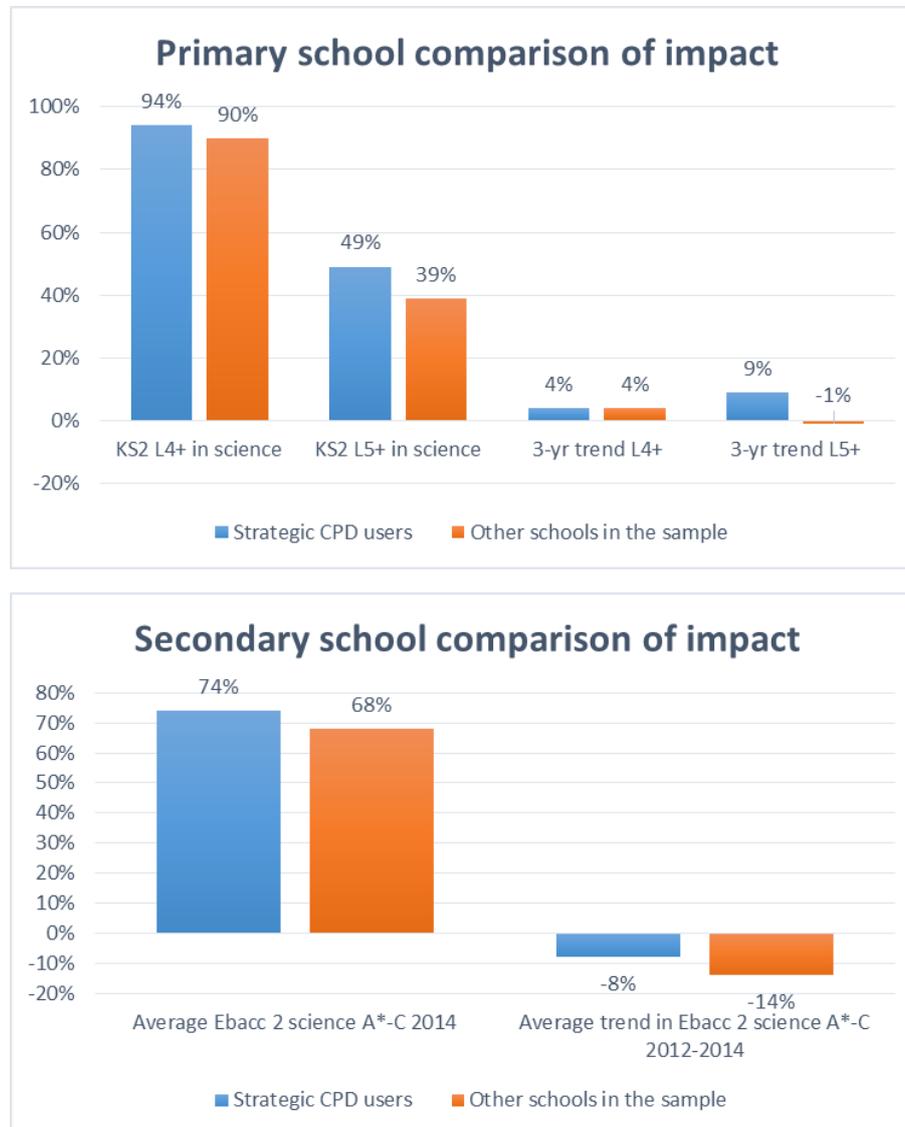
- a) their strategic planning of CPD;
- b) their actions to follow-up the CPD and embed the learning in pedagogical practice; and
- c) the strength of their evaluative systems.

A rating of '1' indicated a school which was, in our view, a 'strategic user' of CPD and a rating of '4' denoted a school that was an 'ad hoc user' that was not systematic or planned in their use of CPD. This classification provided a lens through which to explore the question of whether there are factors that enable schools to maximise the impact of the CPD that they access.

We analysed the achievement and improvement of the schools we interviewed in the following way. First, we added together the scores we ascribed to each school against each of the three categories listed above (1 if they were a 'strategic user', 4 if they were an 'ad hoc' user). We then separated schools with a combined score of five or below (the most strategic users of CPD) and compared these

to all the other schools we interviewed. The results suggest that, in both phases, the more strategic users of CPD were, on average, performing slightly better and improving slightly faster (or in the case of secondary maintaining their results more consistently) than the other schools in our sample.

Figure 14: Comparison of the relative impact seen by schools that are the most strategic users of science CPD compared to other schools that took part in this evaluation



This is an important finding. It lends weight to the argument that, even within a group of schools pre-selected for having higher-than-average levels of engagement with CPD from the Network, those schools that are approaching the planning, embedding and evaluation of their CPD in a more strategic fashion are more likely to realise the potential gains and see higher impact resulting from the CPD. In the next chapter, we explore in detail the characteristics of the schools that are the most strategic users of science CPD to understand how they maximise the impact of the science CPD that they access.

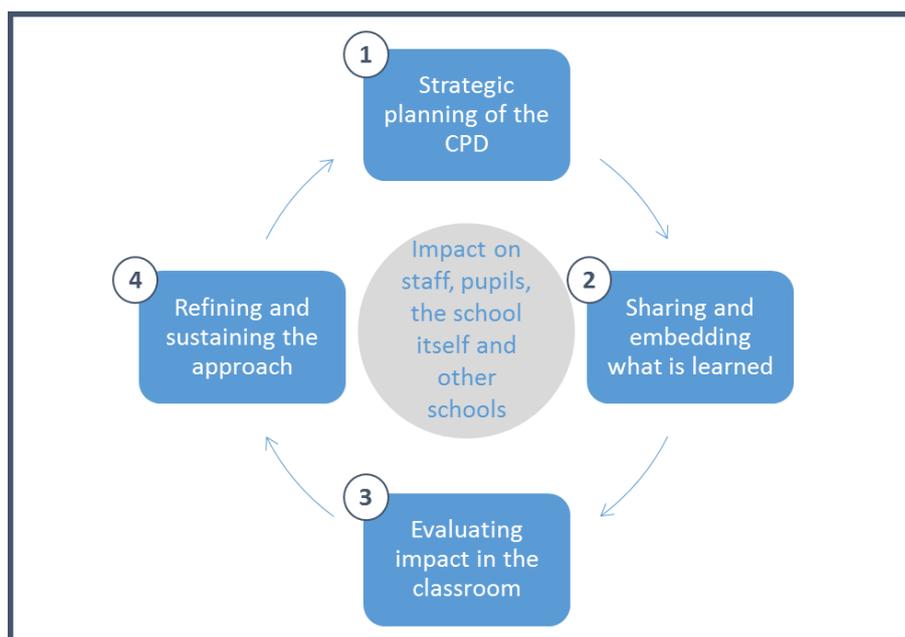
Chapter 2: How do schools maximise the impact of science CPD?

The preceding chapter analysed some of the differences in the types and levels of impact on schools accessing science CPD from the Network. As we have shown, the link between accessing science CPD and impact in the classroom is not always clear-cut: this is influenced significantly by a school's approach to science CPD and subject-specific CPD more generally. Based on the evidence we have gathered through this project, we think this approach includes four key phases, which are:

1. how schools **plan** the science CPD that they access;
2. how schools **embed** what staff have gained from science CPD in the practice not only of the member of staff who accessed the CPD, but in the practice of others across the school;
3. how schools track and **evaluate** the difference that the science CPD and the subsequent changes they made on science teaching and learning in the school; and
4. how schools **sustain** the impact of the science CPD they have accessed by regularly refining, reflecting on and showcasing their approaches to inform their future science CPD priorities.

These four phases are linked, and the most strategic users of science CPD from the Network that we engaged through this project used them as part of an ongoing cycle to sustain and improve high-quality science teaching and learning. This cycle is set out in figure 15 (below).

Figure 15: The four-phase cycle through which schools maximise the impact of science CPD

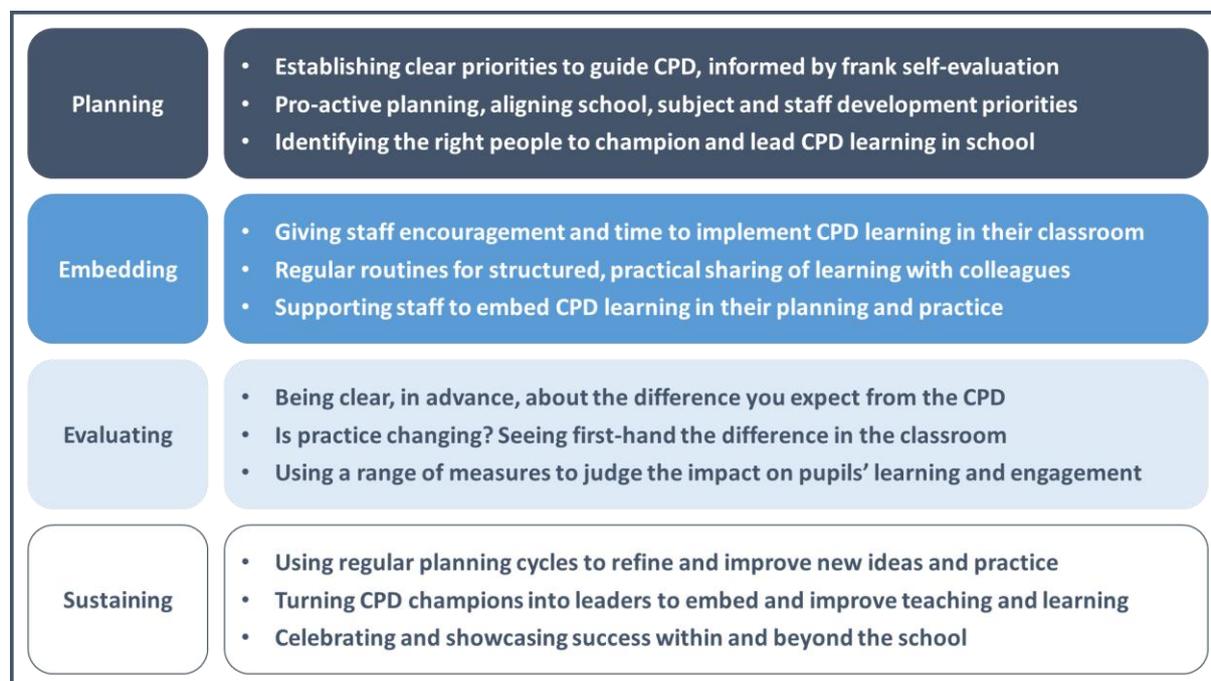


We have used these four phases to structure this chapter. In short, we found that there were twelve characteristics of the approach taken by the most strategic users of science CPD from the Network. These twelve characteristics – three each under the headings of planning, embedding, evaluating and sustaining – are summarised in figure 16 (below). In the remainder of this chapter, we explain and illustrate in detail the approaches taken by the most strategic users of science CPD and how approaches differed across all of the schools that took part in this evaluation.

We should point out that the scope of this evaluation was the way in which schools used science CPD that they accessed from the Network. For that reason, what we describe in this chapter relates specifically to the way in which schools used Network CPD. Nevertheless, many of the most strategic users of science CPD accessed CPD from a range of sources, including the Network, and the

approaches described to us about planning, embedding, evaluating and sustaining applied to their overall approach to science CPD. These approaches have relevance, however, not only to science CPD, but also to subject-specific CPD more broadly. Indeed, many of the schools that we found to be the most strategic users of science CPD had similar approaches to planning, embedding, evaluating and sustaining subject-specific CPD in other subject areas.

Figure 16: How schools maximise the impact of science CPD – Characteristics of strategic users of science CPD from the Network

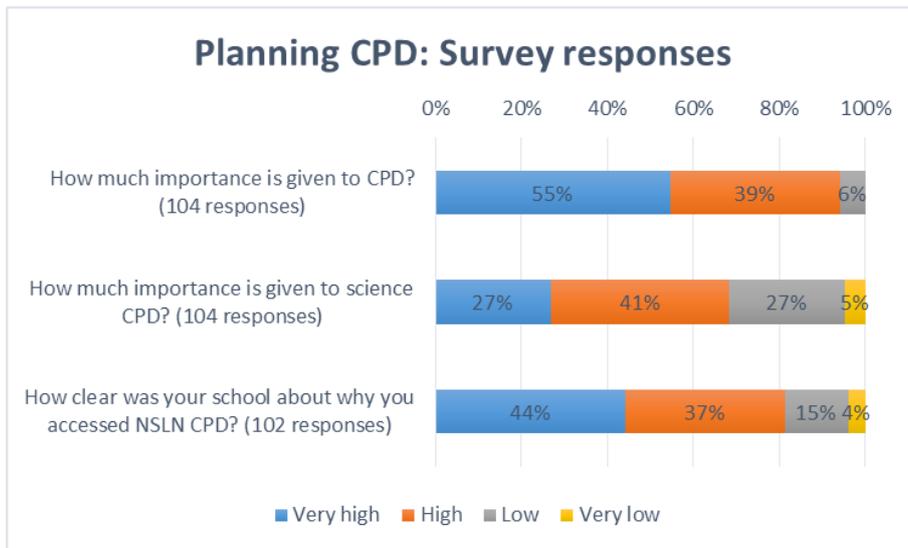


How schools maximise the impact of science CPD – planning

In the survey of 104 schools we undertook in phase two of this evaluation, we asked three questions relating to how a school approached and planned science CPD. The first was about the overall level of importance given to CPD in general in the school, while the second asked about that afforded to science CPD specifically in order to compare its relative importance. The third asked how clear the school was about why it accessed the CPD from the Network that it had. The results can be seen in figure 17 (below).

This shows that, overall, the subject leaders in the majority of the 104 schools we engaged considered that CPD had a high priority in their school. Over nine in 10 subject leaders (94%) said CPD had a high (39%) or very high (53%) priority. The proportion of subject leaders who stated that science CPD also had high priority in their school was broadly similar (41%, compared to 39% who said CPD in general had a high priority). Nevertheless, subject leaders were less likely to say science CPD had a very high level (27%) of importance than CPD in general (55%), and more likely to say its importance was low (27%) or very low (5%).

Figure 17: Planning CPD – survey responses



In terms of how clear the school was about why it accessed the CPD it had from the Network, eight in 10 subject leaders (81%) said they were clear or very clear about this – 37% said they were clear, and 44% said they were very clear. This finding was borne out by the judgements we recorded for the 59 schools that we interviewed, as can be seen from figure 18 (below). For reference, the grid showing the criteria we used to reach these judgements can be found at Annex B.

Figure 18: Isos judgements about schools' approaches to planning of science CPD



When we looked at the breakdown between survey responses from subject leaders in primary and secondary schools, we saw some interesting differences in how they viewed their schools' planning of science CPD.

Figure 19: Planning CPD – survey responses from primary and secondary schools

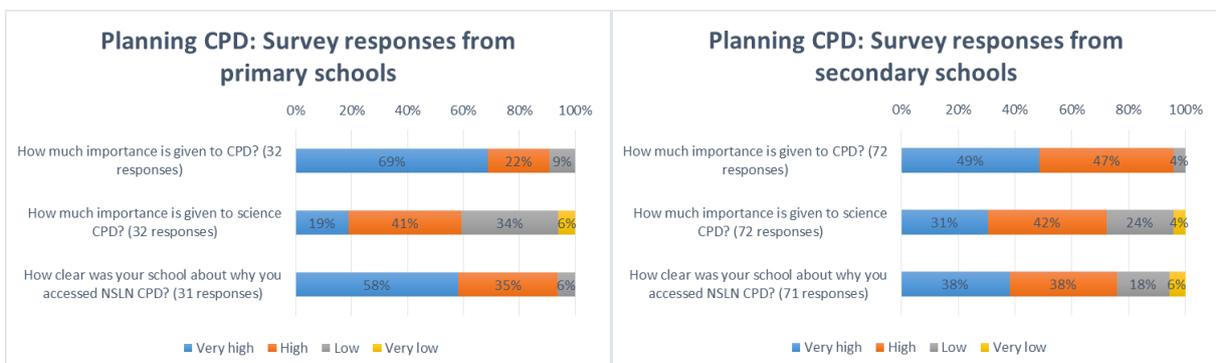


Figure 19 (above) shows primary and secondary schools afford similar levels of importance to CPD in general: 91% of primary school science leaders and 96% of secondary school science leaders said CPD

had a high or very high priority. The figure also suggests, however, two importance differences. First it indicates that primary schools are less likely to treat science CPD as a high or very high priority (60% compared to 73% in secondary schools). Second, however, it also suggests that primary schools are more likely to have clear aims for the science CPD that they access from the Network (58% said they were very clear compared to 38% in secondary schools). Through our fieldwork, we identified three ways in which schools were planning their science CPD effectively.

Establishing clear priorities to guide CPD, informed by frank self-evaluation

The most effective and strategic users of science CPD we engaged had a clear set of evidence-based priorities that shaped the CPD that they accessed. Most used an annual planning cycle comprising two elements. The first was rigorous analysis of pupil-level progress and attainment data. This was done to identify areas of science in which pupils were not doing as well as they might. Some secondary schools, for example, use data from students' tests to identify topics or types of questions, such as extended writing, in which students had achieved less well.

The second was frank and honest self-assessment, including auditing knowledge and skills of the current staff team, to develop a long-term action-plan. In their self-assessment processes, schools analyse what has been done in the past and what new developments they may need to prepare for, and develop a formal set of priorities that are shared with senior leaders and staff. This helps not only to create a clear set of long-term plans to guide the school's choice of science CPD, but also to ensure the school is clear at the outset about what they want to achieve from the science CPD that they access.

Systematic, evidence-based, strategic planning in each subject area

At **Hutton Rudby Primary School** in North Yorkshire, each subject area, including science, undertakes an annual review of teaching and learning. The evidence gathered, combined with overarching school priorities and needs identified through staff performance appraisal, is used to plan the school's CPD needs for the year. Likewise, at **Exeter Road Primary School** in Exmouth, school and science leaders develop clear development priorities, informed by their own planning and staff appraisals, that drive the school's choice of science CPD.

Pro-active planning, aligning school, subject and staff development priorities

The most important characteristic of the plans for science CPD developed by the most effective and strategic users is that they provide a common thread that runs through and draws together school, subject and personal development priorities. These schools use the staff performance appraisal cycle to match staff interests and needs to school and subject priorities and CPD opportunities, to formalise plans for staff to pursue particular science CPD opportunities, and then to review the difference this has made. As the case study of St Gabriel's shows, the planning process enables the school's Head of Science to match individual members of staff to science CPD priorities, which in turn sustains the quality of science provision and enhances their knowledge, skills and leadership skills.

Matching school, subject and staff development priorities

The Head of Science at **St Gabriel's Roman Catholic High School** in Bury states, 'I want all to be our local expert in something.' This is achieved by analysing the developments in national policy, the priorities of the school and science department, and staff appraisal. The Head of Science then identifies staff at the right stage of their careers to become the local expert and champion for a particular aspect of science, for example enhancing literacy skills in science. The CPD staff access

therefore has a triple benefit: it gives that member of staff access to new ideas, it gives them the opportunity to develop their leadership skills within the school, and at the same time the learning is disseminated to other members of staff.

By contrast, less strategic users of science CPD did not have clear priorities and pro-active plans for the CPD that they had accessed from the Network. The choice of CPD that these schools accessed was heavily influenced by “what was in the brochure” without any link back to the subject or school priorities. Not having clear plans for how science CPD will support subject and school priorities has a knock-on effect on whether and how effectively schools share and embed the learning and evaluate the impact of CPD – without having clear priorities in the first place, the onus to disseminate CPD learning and check progress is less strong or completely absent.

Identifying the right people to champion and lead science CPD learning in school

The example of St Gabriel’s, highlighted above, shows that an important aspect of planning science CPD is matching the development needs and interests of individual members of staff with science CPD priorities and opportunities. As the Headteacher described to us, a vital part of planning all subject-specific CPD, including science CPD, was to ask, *‘Is it the right thing, for the right person, at the right time?’*

Other schools that we visited, primary and secondary alike, described in similar terms how they identified individuals based on the stage they were at in their career, the nature of their role, and their (potential) leadership skills to access specific science CPD opportunities, to channel the learning they gained back into the school, and to champion and support the implementation of new ideas.

The primary schools we visited were more likely to focus on the subject co-ordinator(s), seeing science CPD as an investment in their leadership skills and a spur to use their enthusiasm to share and embed new approaches to science teaching and learning among their teaching colleagues.

Reinvigorating science teaching through new subject leadership

At **Duddon St Peter’s Church of England Primary School** in Cheshire, three years ago, science was not seen with enthusiasm by pupils or staff. The school appointed two new Science Co-ordinators, for K1 and KS2 respectively, who were passionate about science. They have been accessed CPD from the National Science Learning Network aimed at developing primary subject specialists, which has played a key role in transforming science teaching and learning at the school. During this time, the proportion of pupils achieving expected attainment levels in science teacher assessments has risen from 56% in 2012 to 88% in 2014.

Similarly, at **Richmond Methodist Primary School** in North Yorkshire, the Science Co-ordinator has played a key role in championing new, investigative approaches in science and giving teachers the confidence to implement these in their classrooms. The Science Co-ordinator acts as a ‘gateway’ to new ideas, including drawing on ideas gained from the Network’s CPD, and working with teachers to plan science lessons together than will enthuse pupils and link to other areas of the curriculum. Like Duddon St Peter’s, the proportion of pupils achieving expected attainment levels has risen by 16% so that, in 2014, nine in 10 pupils achieved this level.

Secondary schools, as in the example of St Gabriel’s highlighted above, were more likely to identify individual members of staff to access specific science CPD opportunities. Some larger primary schools

we visited, such as Tower Road Academy, had begun to develop a similar approach, identifying key individuals within the school to lead on developing specific aspects of science teaching and learning.

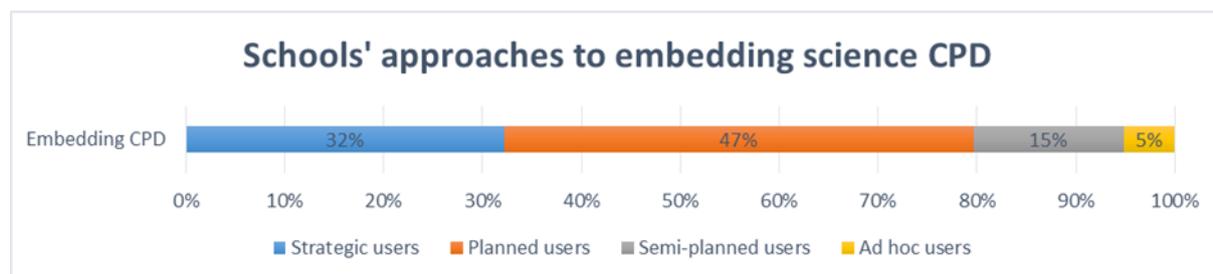
Identifying leaders and fostering leadership

At **Tower Road Academy**, a large primary school in Boston, school and subject leaders recognise the importance of sustaining and developing their work in science. Central to their approach is identifying and training individual teachers to be science ambassadors and leaders, giving them specific responsibilities and empowering them to develop their skills through accessing CPD and then working with and coaching other staff when they return to school. For example, a particular focus has been on supporting one member of staff to develop a specialism in working scientifically in the early years. The school also fosters pupils' leadership capabilities, using their questions to enrich science lessons and consulting the school's pupil-led science council to inform and develop the science curriculum, as well as plan and initiate whole-school science activities.

How schools maximise the impact of science CPD – embedding

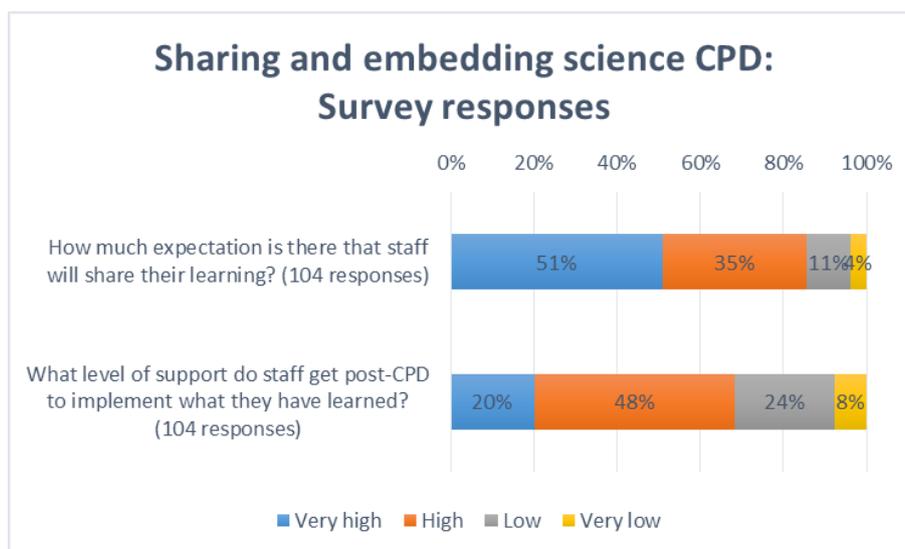
As we noted in the introduction to this report, previous research studies of science CPD, notably Judith Bennett et al's 2010 study, have highlighted the importance implementing, sharing and embedding learning from science CPD. In our fieldwork, there was near-unanimous recognition of this fact – schools recognised the need to make time to reflect, implement and disseminate science CPD learning. Fewer schools, however, considered that they were effective in implementing what staff had learned from science CPD. As figure 20 (below) shows, we judged that fewer schools were strategic or planned in their approach to embedding science CPD – while we judged 49% of schools to be strategic users and 37% to be planned users in how they *planned* science CPD, we judged 32% of schools to be strategic users and 47% to be planned users in how they *embedded* science CPD.

Figure 20: Isos judgements about schools' approaches to embedding of science CPD



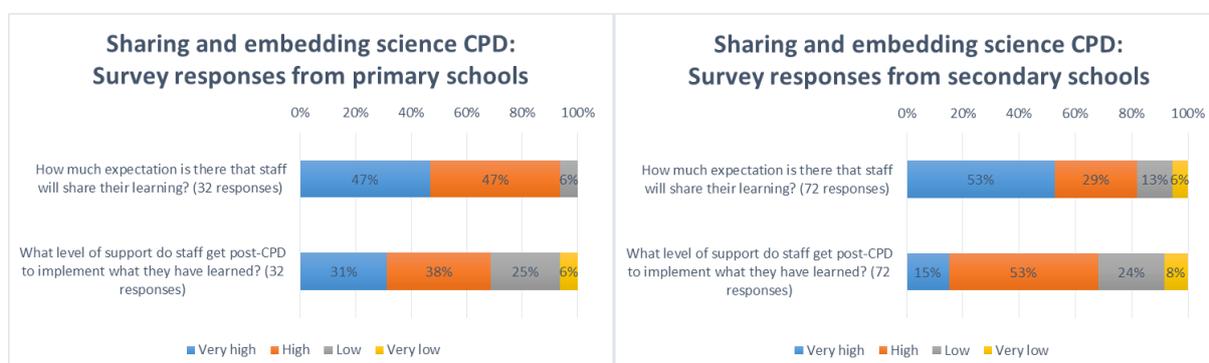
The survey data we gathered showed a significant mismatch between the expectation that staff would share the learning of their CPD and the support that they actually received to do so. As figure 21 (below) shows, just over half (51%) of the subject leaders reported that there was a very high expectation that they would share what they learned from CPD, but only one in five (20%) reported that they received a very high level of support to implement what they had learned. The vast majority of schools cited a lack of time, competing priorities, and the absence of routines for formal and effective dissemination of new ideas as the reasons for this mismatch. Subject leaders in secondary schools in particular highlighted this point. As one subject leader put it, 'collaboration between science teachers is the best science CPD you are ever going to get, but that collaborative aspect is missing 100% for us. The biggest barrier to science CPD we face is the lack of understanding among senior leaders about the complexity of teaching, in effect, three or four different science subjects in one.'

Figure 21: Sharing and embedding science CPD – survey responses



When we looked at the breakdown between responses from primary and secondary schools, we saw the same pattern. Overall, 94% of primary school subject leaders and 82% of secondary school subject leaders said that there was a high or very high expectation that science CPD learning would be shared, while the proportion of schools providing high or very high levels of support for sharing science CPD learning was 69% and 68% respectively. Nevertheless, what also struck us was that among the schools that took part in this evaluation, the mismatch between expectation and support to embed learning was less stark in primary than in secondary schools. This was particularly the case for those schools in which the subject leader said that there was a very high expectation that science CPD learning would be shared. In secondary schools, 53% of subject leaders said there was a very high expectation of sharing but only 15% said there were very high levels of support to do this. In primary schools, a comparable proportion (47%) of subject leaders said there was a very high expectation of sharing, and 31% (double the proportion of secondary schools) said there were very high levels of support. As with schools' approaches to planning science CPD, the survey data suggest that primary schools are more strategic in their planning and more deliberate in providing support to staff to spread new ideas gleaned from the science CPD they have accessed from the Network.

Figure 22: Planning science CPD – survey responses from primary and secondary schools



Giving staff encouragement and time to implement science CPD learning in their classroom

The vast majority of the subject leaders, teachers and technicians to whom we spoke during this evaluation highlighted the value of being able to take away from Network CPD activities specific, bite-size, practical ideas that they could implement in their own classrooms. Many from the schools that

took the most strategic approach to embedding science CPD learning also gave staff specific encouragement and time to implement what they had learned in their CPD *before sharing it with colleagues*. The sequencing of these is crucial.

Subject leaders in these schools argued that a key part of maximising the impact of science CPD is disseminating learning and embedding new ideas effectively, and that crucial to this is winning over their colleagues to try something new. The hurdle that subject leaders and others seeking to champion the spread of a new idea in a school had to overcome was the response, *“science CPD learning is fine in theory, but how would it work in this school?”*

For that reason, some of the most strategic users of science CPD that took part in this evaluation gave staff the time to test out the new ideas they had brought back from the Network’s CPD in their classroom, and in some cases to work with another colleague or small group of colleagues to do the same. They then reflected on how this had worked and the difference it had made to them and to their pupils. Armed with this information, they could then share this with colleagues and could show them specifically how they had used the Network’s CPD within their school’s specific context.

Working collaboratively to test and embed new teaching approaches

At **Woodthorpe Primary School** in York, a particular focus has been on improving the progress and attainment for gifted and talented pupils in the school. Having accessed CPD from the Network related to this topic, the Science Co-ordinator then worked with the school’s Gifted and Talented Co-ordinator to implement what she had learned in their classrooms. They took a baseline of where their pupils were at the outset, and then tracked their progress. Since the school is a two-form entry, they were able to compare the progress made by their class against the other class in the same year-group. They found that pupils in their class had made significantly greater progress over a term and a half. Once they had clear evidence of impact, they then shared their learning with the wider group of staff, and have worked with them to embed these new approaches in the school.

Regular routines for structured, practical sharing of learning with colleagues

Following on from the point above, what also marked out the most strategic users of science CPD was range of routines they used to share CPD learning regularly. These were not cumbersome or bureaucratic arrangements taking up vast amounts of staff time, but rather schools making regular, well-planned use of existing times when staff were together, as one school described it, to ‘continually fill staff with new ideas and opportunities’. These included regular “speed CPD” sessions, or what Stephenson Memorial Primary School called their fortnightly “light-bulb moments” session.

“Light-bulb moments”

Every teacher we spoke to at **Stephenson Memorial Primary School** in North Tyneside mentioned the word ‘collaboration’ to describe the way staff worked together in the school. As one teacher said, ‘the collaboration here is unique.’ One of the ways members of staff collaborate is through fortnightly “light-bulb moments”. This is 20 minutes of “speed CPD-sharing” while the Headteacher leads an assembly. It started when the Deputy Headteacher gathered staff together to share ideas about differentiation. Subsequent sessions were planned so that staff could feedback on how they were using these new ideas. The “light-bulb moments” sessions quickly gathered momentum. Not only are they valued by staff as a regular drip-feed of new ideas, but slots for staff to present to their colleagues are now booked up in advance.

They also included more in-depth opportunities for colleagues to work together collaboratively to research and plan a new teaching approach or develop a new curriculum plan. Science staff at Maria Fidelis School in Camden have one INSET day each year together. The staff choose the science CPD that they access so that they all have the same experience, and can then reflect on what they have learned and plan changes together. In other schools that we visited, school leaders had created additional time during the teaching timetable for individual members of staff or whole department teams to have time together to reflect on and plan how they could develop their teaching resources and practices. As one school leader explained, ‘we build in time for our staff to be reflective practitioners’. These approaches of giving staff some collective departmental time away from their teaching commitments were more common in secondary schools than in primary schools.

Departmental INSET time

At **Maria Fidelis Roman Catholic Convent School** in Camden, the school uses a range of different types of CPD, but each year the science department has a department-wide INSET day, so that all staff get to experience the same CPD. This is chosen by staff together, informed by departmental priorities. The learning from this collective development experience and from other CPD activities is then brought back into school and shared in a structured way: an hour is set aside each week for the department to share knowledge, and staff are supported and given time to reflect on their learning, present what they have done, and prepare resources to share with their colleagues.

Similarly, at **Kendrick School** in Reading, the science department has an annual subject-specific INSET day to share new ideas, including that drawn from CPD, and to plan how these can be incorporated into science teaching and learning across the school and, crucially, how staff will know this is making a difference to students’ learning.

What was common about the approaches to embedding science CPD learning among the most strategic users of science CPD, in primary and secondary schools alike, were three things.

1. **Range** – the most strategic users had a range of ways in which learning from science CPD and new teaching ideas could be shared, including the less formal, “speed CPD” sharing to the more in-depth, reflective lesson study, action research and joint practice development.
2. **Regularity** – sharing learning from science CPD was not an “add-on” that was done “if there is time”, but a routine activity, highly valued by staff, and respected and maintained as a key part of “what we do at this school”.
3. **Hands-on** – many of the schools that took part in this review who reported high levels of impact on staff and pupils had implemented new, enquiry-based, practical approaches to science in their classrooms. The most strategic users of science CPD had applied these principles to the way in which they shared CPD learning with their colleagues – rather than explain the learning in the abstract, sharing sessions were structured to provide colleagues with opportunities to try new ideas and experiments so that they would be comfortable and confident using these in their own classrooms.

By contrast, less strategic users relied predominantly on brief, oral updates describing the science CPD courses or activities that they had accessed and mentioned where they had saved the resources from the course. As noted above, without science CPD being informed by school and subject priorities and without explicit, regular routines for embedding practice, the opportunities for hands-on testing and collaborative reflection, so crucial to spreading new ideas beyond a single classroom, can be lost.

Supporting staff to embed science CPD learning in their planning and practice

As we have explained above, strategic users of science CPD recognised that learning from science CPD will not translate automatically into consistent changes in practice across all science teaching in a school. They described, instead, what they saw as the need for deliberate and planned support for staff to make changes and sustain improvements in their practice and ensure consistently high-quality science teaching in all classrooms. Such approaches to supporting staff to refine their teaching practice were comparatively less common among the schools we visited than the approaches to sharing learning described earlier in this chapter. Nevertheless, we did find examples of primary schools, such as that of Tower Road Academy in Boston (in the vignette below), and at Duddon St Peter’s Primary School in Cheshire, where science leaders coached, co-planned, co-taught and observed lessons with colleagues to support them to implement new ideas into their practices. Likewise, in secondary schools, we saw examples of staff within a department working together through lesson study, action research and joint practice development model to implement science CPD learning consistently in their classrooms.

Practical sharing and coaching support to build teachers’ skills

At **Tower Road Academy**, a large primary school in Boston, science leaders see their role as giving teachers the confidence to try new ideas in their classroom. A small core team of science leaders share key principles and practical pointers from science CPD in regular all-staff meetings so that members of staff get the chance to try them out and become comfortable using them. Subsequent staff meetings are used to check how teachers have used these new ideas, and gather feedback. Science leaders also provide direct support to teachers in their classrooms, through team-teach, coaching and lesson observations. Given the size of the school, this is crucial to ensuring consistently high-quality science teaching across the school.

At **Southend End High School for Boys**, a selective convertor academy in Southend, a commitment to collegiate learning runs like a golden thread through the school. The Head of Science described how the outcomes of any CPD undertaken ‘start to spread out immediately’ because sharing ideas and having conversations about learning is commonplace. Teaching staff said that they have all developed particular areas of expertise and also know each other’s strengths. They said the open door teaching policy means that they share strategies and go and see new ways of teaching in action in the classroom, rather than just relying on presentations in a staff meeting to disseminate the outcomes of CPD.

How schools maximise the impact of science CPD – evaluating

As we mentioned in the introduction to this report, past studies of science CPD have found that CPD participants can find it difficult to pinpoint the difference that CPD has made, particularly to pupils’ learning. The studies include Judith Bennett et al’s 2011 study, *Modes of Professional Development*, and two 2013 studies carried out by the National Foundation for Educational Research, the first on headteachers’ and teachers’ views towards science-specific CPD, and the second on partnership activity within the Network.

This finding has been borne out by our evaluation. As figure 23 (below) shows, the approaches of the schools that took part in this study were least well-developed when it came to evaluating and tracking impact. For example, as shown in the figures earlier in this chapter, whereas we judged almost half (49%) of schools to be strategic users when it came to planning science CPD and almost one third

(32%) to be the same when it came to embedding learning, we judged only 14% of schools to be strategic users when it came to evaluating impact.

Figure 23: Isos judgements about schools' approaches to evaluating of science CPD

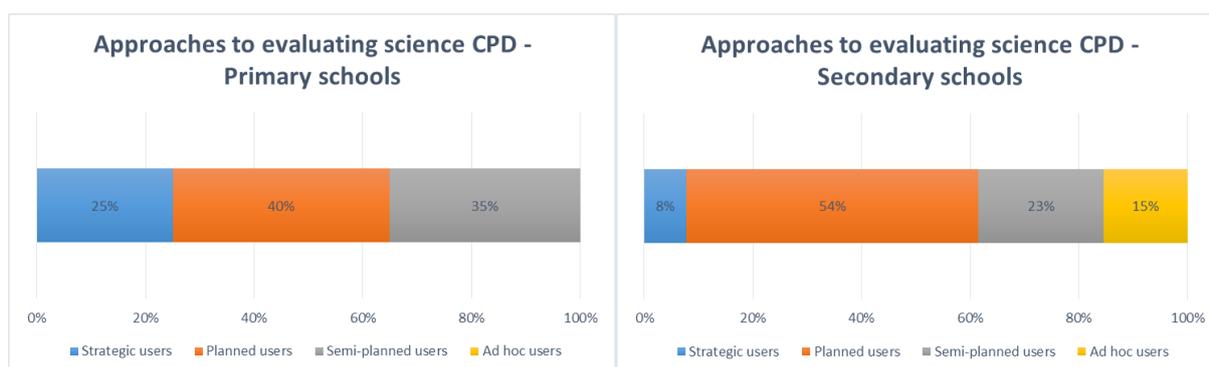


In many instances, subject leaders reported that they were not confident about how they would track the impact of specific CPD instances beyond a follow-up conversation with a member of staff about whether the CPD had been “worth it”. Some subject leaders pointed out that different science CPD activities would lead to different types of impact and would need to be tracked differently. For example, they argued that the expected impact would be different for science CPD focused on developing the skills of a newly-qualified teacher, compared to science CPD focused on enhancing the subject knowledge of a non-subject-specialist, or compared to science CPD focused on developing a new whole-school approach to teaching, and would be tracked in different ways. By contrast, what a small minority of subject leaders argued was that they did not have the time or, in some cases, think it was worthwhile to track the impact of specific science CPD activities that the school had accessed.

The issue about subject leaders and teaching staff not being confident in tracking the impact of CPD in the classroom has implications for the Network and those facilitating CPD within it, which we return to in the final chapter of this report. What it also means is that some schools are not routinely looking for evidence of impact from new approaches and using this to refine their practices and inform strategic choices about the CPD they need to access in the future.

Before we describe the ways in which the most strategic users of science CPD were evaluating impact, we want to make one final point about the differences we found between primary and secondary schools' approaches to evaluating impact. As figure 24 (below) suggests, while the overall proportions of primary and secondary schools that we judged to be strategic or planned users is broadly similar (65% and 62% respectively), there were two important differences. First, comparatively more primary schools were judged to be strategic users in their approach to evaluating science CPD than secondary schools (25% of primary compared to 8% of secondary schools). Second, while we did not judge any primary schools to be ad hoc users, based on what was described to us, we did judge 15% of the secondary schools we interviewed to be ad hoc in their approach to evaluating the impact of science CPD.

Figure 24: Isos judgements about primary and secondary schools' approaches to evaluating science CPD



Being clear in advance the difference you expect to see from science CPD and track this

As we mentioned earlier in the chapter, the most strategic users of science CPD had well-developed and clear plans that informed the science CPD that they accessed, including that from the Network. These were informed by school, subject and staff development priorities, using an annual review or self-assessment process aligned to the staff appraisal process. The most strategic users also used their planning processes to determine the impact they expected to see as a result of the science CPD that they accessed, both individual instances and cumulatively, and the ways in which they would know this was making the desired difference. In other words, what marked out the most strategic users was not just that they had well-developed processes for planning science CPD, but they also used these routines to return to their science CPD plans to capture evidence of what was working, to tweak teaching practices, and inform future planning.

Is practice changing? Seeing first-hand the difference in the classroom

The vast majority of schools that took part in the evaluation argued that, “if CPD makes teachers more confident, this will lead to changes to their practice, and will consequently have an impact on pupils”. This theory of change has much to recommend it – it is well-established that one of the most powerful factors in influencing a pupil’s learning is the quality of teaching. Strategic users, like Winterbourne Earls Primary School, use development surveys to track levels of confidence among staff about teaching science as well as to gather feedback from them to inform future CPD priorities.

Gathering practical feedback from staff to inform future science CPD priorities

Winterbourne Earls Church of England Primary School in Wiltshire runs a regular science staff development survey to gather ideas for a wide range of practical improvements in science. The survey provides not only valuable suggestions of new ideas, but also provides a useful “temperature check” of how confident staff are feeling in teaching science and how learning from CPD is helping them to plan and teach science lessons to their pupils.

Nevertheless, the most strategic users did not believe that that CPD learning would *automatically* translate into changes in teaching practice. They recognised that teaching practice needed to be nurtured. The most strategic users of science CPD used systematic processes of lesson observations, learning walks and book scrutiny to look for evidence that teaching staff and pupils were doing things differently as a result of the CPD the school had accessed. They used these processes systematically, deliberately looking for evidence that the science CPD that had been accessed was having an impact on teaching practice and learning. These were reinforced by work to inculcate and sustain a culture in

the school where conversations about pupil learning and new pedagogical practices were commonplace, as described in the preceding section on disseminating and embedding learning.

Again, what marked out these schools as strategic users of science CPD was not that they had spent huge amounts of staff in developing sophisticated systems for tracking impact, in addition to their school's systems for tracking pupils' learning already in place. Instead, it was that these schools used their existing quality-assurance processes judiciously and systematically to look for evidence of the difference the CPD they had invested in was making.

This approach, common among strategic users of science CPD, had a further important effect. This was that it provided subject leaders with opportunities to coach staff who were finding it more challenging to implement changes, to identify refinements they needed to make in teaching practices and to identify potential leaders who could champion new approaches in different areas of the school.

Using a range of measures to judge the impact on pupils' learning and engagement

We know that schools have a wealth of data about pupil learning. Many subject leaders we interviewed reported that they were not routinely using this pupil-level data to look for evidence of impact of science CPD in the classroom. Strategic users of science CPD, by contrast, used a wide range of indicators to look for evidence of impact from new practices adopted following CPD activities. In addition to pupil progress and attainment in science, these measures included feedback from pupils through pupil voice surveys, take-up rates of science and STEM extra-curricular activities, and (in secondary schools) rates of students going on to study triple science at Key Stage 4 or choosing to study specific subjects such as physics at Key Stage 5. Often, strategic users of science CPD would select the most appropriate outcome-measure, leading indicator or proxy for the specific CPD activity they had accessed – triple science take-up rates for CPD activities relating to triple science.

As described below, schools like Ormiston Maritime Academy also used a variety of “soft” indicators, such as subject-level data on the rate of students being out of the classroom, as an indicator of students' level of engagement in particular subjects.

Using both hard and soft indicators to track impact in the classroom

As well as regular scrutiny of progress and attainment data, leaders at **Ormiston Maritime Academy** in Grimsby use “soft” indicators, such as student voice surveys and subject-level data on students being out of the classroom, to track levels of student engagement. Leaders use learning walks to see how learning from CPD is being used in the classroom. To complete the evaluation cycle, student assessment data is used to look at how students are doing on certain types of questions compared to how they were doing before staff accessed the CPD.

In addition, schools like South Farnham School maintain a sharp focus on impact through systematic processes that bring staff together in subject group and year-group meetings to plan the implementation of new ideas, evaluate their effectiveness, and refine teaching practices.

Systematic routines for embedding new ideas about science teaching and learning

At **South Farnham School**, a large primary school in Surrey, there is an established, systematic cycle for embedding learning across the school. First, a member of staff will provide a short presentation to their subject group, including a short pack with action-points and resources relevant for each year-group. The subject group has representatives from each year-group, who then take this back to their year-group meetings. Teachers then try out the new approach in their classroom, evaluate

its effectiveness and provide feedback. This cycle informs both ongoing planning and end-of-year subject evaluation and planning, including annual reports to governors by subject leaders.

What differentiated these schools was not just the range of measures they used and the sharp focus on them, but also how the schools *used* the evidence that they gathered. They did not attempt to single-out and prove the precise impact of a particular practice adapted from a science CPD activity, but rather used each item of evidence as a clue, which, taken together, might suggest approaches that were working well and those that needed to be revisited and refined.

By contrast, the less strategic users simply looked at end-of-year teacher assessments or exam results. To be sure, these are important measures of impact, but they do not allow school and subject leaders to identify whether particular CPD activities have made a difference to science teaching and learning, nor to make tweaks and refinements during the course of an academic year that can be vital to maximising impact.

How schools maximise the impact of science CPD – sustaining

Using regular planning cycles to refine and improve new ideas and practice

The most strategic users to whom we spoke during this evaluation did not see the three preceding phases described above – planning, embedding and evaluating – as one-off activities. Instead, they saw them as forming a cycle of constantly refining and improving science teaching and learning and topping this up with judiciously-selected, high-quality science CPD. They do this not only to improve their own teaching and learning, but to build their leadership capacity so as to be able to spread their practices to other subject areas and partner schools – and, crucially to test and refine them in light of peers’ feedback. We did find, however, that the vast majority of schools, including the strategic users, planned their science CPD priorities on an annual basis and rarely more than a year in advance. A very small minority of the schools that took part in this evaluation could describe their priorities for improving science teaching and learning for the next three years.

Turning CPD champions into leaders to embed and improve teaching and learning

In our fieldwork, we found that the most strategic users of science CPD also used the CPD that they accessed to develop the leadership skills of their staff. As described in our case studies and highlighted in the vignettes earlier in this chapter, school and subject leaders at schools such as Stephenson Memorial Primary School in Cheshire and Tower Road Academy in Boston described the role that science CPD played not only in bringing new ideas into the school, but also giving members of staff the opportunity to demonstrate and develop their leadership skills. As we have also noted in chapter 1, these schools were also among those who were most likely to report an impact on staff progression and retention.

Celebrating and showcasing success within and beyond the school

Strategic users were quick to ensure that any promising new ideas and evidence of their effectiveness were not only celebrated but showcased. These schools provided regular reports on science to senior leaders and governors, and used the interest of the leaders and governors to find opportunities to share learning from science with other subject areas.

Showcasing success and spreading effective practice

The successful use of science CPD to improve science teaching and learning has not gone unnoticed at **Maria Fidelis School** in Camden: senior leaders are increasingly taking an interest in how the science department is securing year-on-year improvements and the role that CPD is playing in process. The Head of Science was recently asked to provide an update to the curriculum committee of the school's governing body. Similarly at **Altrincham Grammar School for Girls** in Trafford, senior leaders encourage staff to lead whole-school CPD where there is relevance beyond their immediate subject area. The enthusiasm of science staff for their subject has clearly had an impact on their colleagues in other subjects, however, with many now volunteering to mentor groups of students as part of a science and sustainability project that the school is working on with Manchester University.

While school-to-school support is becoming increasingly common across the education system in England as a means of delivering *support for school improvement*, in this evaluation we found that the connections between schools *at individual subject-level* were developing more gradually. In our interviews with subject leaders, many spoke about the role the previous local authority subject leaders networks had played in bringing subject leaders together, and how, in many areas, these networks had fallen into decline. What we also found, however, was that strategic users of science CPD were more likely to be involved in science-specific school-to-school support than other schools that took part in the evaluation.

Some of these local science networks and clusters were well-established, such as the examples of Millais and Altrincham Grammar School for Girls, both of which, in addition to using CPD from the Network, also lead local science learning partnerships.

Disseminating science CPD learning through school-to-school collaboration

Millais School in Horsham, West Sussex, is a hub of inter-school collaboration. The school leads a teaching school alliance, the Millais Alliance, the leadership of which also inspired e-PD (enabling professional development), which is an innovative way in which almost 200 schools can exchange their expertise and development opportunities. Science is a key part of the networks of which Millais is part: the school leads a science learning partnership within the National Science Learning Network. As a result, Millais is able to disseminate their own expertise and that gained from Network CPD to a wide range of schools with whom they collaborate. It is a great example of the way in which the Network is building on the existing expertise, reputation and networks of the country's leading schools to improve science teaching and learning.

Similarly, **Kendrick School** in Reading has an established reputation as a local hub of expertise and excellence in science – the school previously had specialist status in science, and has led local subject leader, technicians, and triple science networks for neighbouring schools. The school saw engagement in these networks as a way of supporting high-quality science teaching and learning across all local schools, both primary and secondary, as well as giving their own teachers ongoing access to new ideas through which to reflect on and enhance their teaching practice. In 2013, the school became a science learning partnership within the National Science Learning Network. In this role, Kendrick has continued to shape high-quality science CPD and give teachers, particularly in primary schools, the skills and confidence to teach science in an engaging way.

In other instances, connections between science leaders had developed from the foundations of existing school-to-school partnerships, such as the teaching school alliance and confederation of local primary schools, in which South Farnham plays a key role. In other instances, schools were in the early

stages of establishing new local science clusters and partnerships. All of these schools shared not only a commitment to shaping excellent science teaching and learning beyond their own school, but also a firm belief in the benefits to their school of their staff leading science CPD among their peers. These benefits included not only improved staff confidence, leadership skills and retention, but also on a more practical level the regular opportunities to pick up what one teacher called 'little gems' in the form of feedback and news ideas from the other schools with whom their school was working.

Chapter 3: Do schools' priorities and the stage in their improvement journey influence the Network CPD that they access?

In chapter 2, we focused on describing the way in which the most strategic users of science CPD from the Network create a cycle of planning, embedding, and evaluating their use of science CPD in order to foster a learning culture within their schools and sustain excellent science teaching and learning.

The way in which schools sustain the impact of science CPD was a particularly important theme in this evaluation. As we pointed out in the introductory chapter, other studies, such as that focusing on the impact of targeted CPD, led by Judith Bennett in 2010, have found that the impact of science CPD can tail off if it is not refreshed regularly and that the choice of science CPD that schools access is linked closely to the overall priorities of the school.

Through our interviews, survey and case study visits, we had the opportunity to explore with schools the journey they had been on over the past three years, the choices they had made about science CPD they had accessed from the Network, and their future plans. For this reason, in this chapter, having explored *how* schools maximise the impact of science CPD, we look at *what* CPD they access from the Network. In particular, we wanted to test whether there were specific “entry-points” or “first rungs on the ladder” for schools in terms of accessing CPD from the Network and whether, having accessed particular CPD activities or resources, this then led on to other CPD choices. Such connections would be valuable to CPD providers, such as the Network, in order to plan and target their CPD offer around the specific needs of different groups of schools.

As we described earlier in chapter 2, the vast majority of schools planned their science CPD no more than one year in advance. They argued that external factors, such as changes to national policy, and internal factors, such as staff turnover or newly-identified staff needs were important determinants of their science CPD plans. This did not mean that those schools were not being strategic in how they planned their science CPD – as we have described, a well-developed annual self-evaluation and planning cycle was an important characteristic of the strategic users we identified. Nevertheless, what it does mean is that it is harder to identify clear sequences in the CPD that schools access.

To explore this further, we looked at two things. First, we looked at schools' entry-points to the Network, specifically whether schools were more likely to first access the Network through a CPD activity or by registering to access resources from the National STEM Centre. Second, we looked at whether there were particular patterns in the science CPD that schools accessed from the Network based on where they were in their overall improvement journey in science.

What came first? Schools' entry-points into the Network

During our fieldwork, we asked schools about whether they accessed resources or other materials from the National STEM Centre. The responses we received fell into three broad groups.

1. **Our school uses the National STEM Centre regularly** – subject leaders reported that using the National STEM Centre was something they did frequently. Many commented on how useful the resources had been and some explained how they used them within their school. For example, one subject leader explained: ‘I access [resources] and feedback to staff. They have been used for ideas for teaching.’

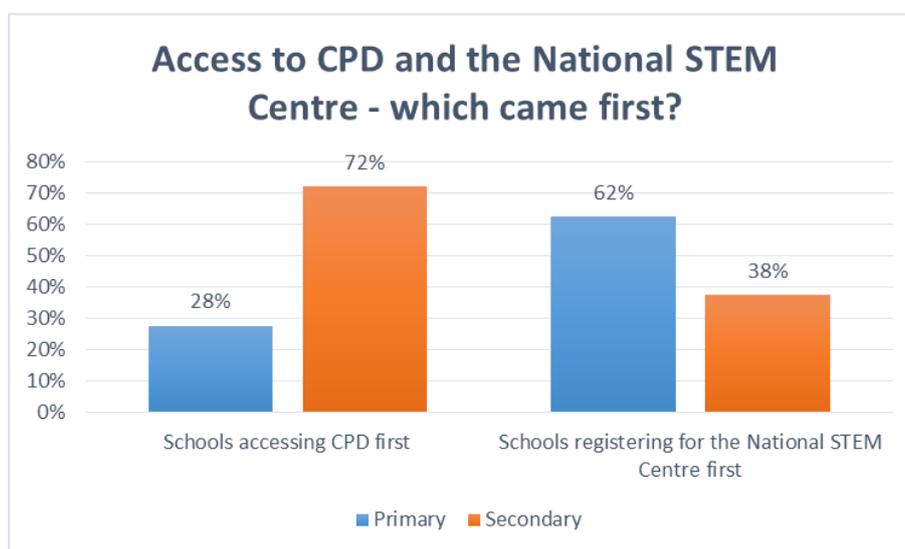
2. **We would like to use the National STEM Centre more often than we do** – this second group of subject leaders reported that they did not use the National STEM Centre resources as often as they would like and hoped or planned to do more. As one subject leader put it when asked whether their school accessed the National STEM Centre, ‘not often, although [staff] should do more and this is on my list of things to promote.’ One school highlighted staff turnover as an issue that had disrupted their use of the National STEM Centre: ‘We have used some ideas to run a STEM club last year. The teacher unfortunately left but we will try to start this again next year.’
3. **I was not aware of it** – a small but significant group of the subject leaders that took part in this evaluation reported that they were not aware of the National STEM Centre, or that they did not know if staff in the school made use of the National STEM Centre resources or not.

We then asked schools that had used resources from the National STEM Centre where this had come in the sequence of their engagements with the Network overall, specifically whether accessing CPD from the Network had led them to the National STEM Centre or vice-versa.

In our fieldwork interviews and visits, we found that the majority of subject leaders to whom we spoke reported that they had found out about and subsequently accessed the National STEM Centre having heard about it through the CPD that they accessed from the Network. These responses were consistent across the primary and secondary schools that we visited.

Following our fieldwork, we then tested this using the Network’s data on what CPD schools had accessed from the Network, whether they had registered with the National STEM Centre, and, crucially, which had come first. Our findings are captured in the chart below.

Figure 25: Access to Network CPD and the National STEM Centre – primary and secondary schools



We treated these findings with some caution for two reasons – first, *registration* with the National STEM Centre is not the same as *regular and consistent use* and, second, the data tell us about when the *school* first registered, which may pre-date the current subject leader and staff team. Nevertheless, the chart shows stark differences between primary and secondary schools. Double the number of primary schools registered for the National STEM Centre before they first accessed CPD from the Network. For secondary schools, we see the opposite trend, with double the number of schools accessing CPD from the Network first compared to those that accessed the National STEM Centre first. We found that this trend was particularly pronounced in relation to secondary schools

that had made regular and systematic use of science CPD from the Network, as described in chapter 1: nine in 10 of the secondary schools that met this criteria had accessed CPD from the Network before they registered for the National STEM Centre.

Building on the analysis set out in chapter 1, we also looked at whether we could draw any conclusions about the relative levels of impact seen by schools accessing Network CPD only, accessing the National STEM Centre only, or accessing both. We found a pattern that was largely consistent with the overall pattern of impact described in chapter 1. We found that both primary and secondary schools that accessed both Network CPD and resources from the National STEM Centre saw higher rates of pupil progress than schools that used only Network CPD or only the National STEM Centre, as well as than schools that accessed neither.

Do schools access different science CPD from the Network at different stages of their improvement journey?

As we have explained in the introduction to this report, in the final phase of our fieldwork, we identified 36 schools that had accessed high levels of CPD from the Network over the past three years that we invited to take part in case study visits. We deliberately selected schools that were at different stages of their improvement journey in science. Figure 26 (below) which we have also included in the introduction, explains the three journey types we identified and the criteria we used to select the schools we invited to take part in case study visits. These criteria included Ofsted judgements and data on pupil attainment and (where available) progress over the past three years.

Figure 26: Identifying schools at different stages of their improvement journey in science

	Description of the stage of the journey	The criteria we used
Sustaining excellence	Schools that are already high-performing schools overall and in science. These are schools that are using science CPD to plan proactively for new developments, and to extend the knowledge and skills of their staff and enhance pupils' experience of learning science.	We selected schools that had been judged by Ofsted to be outstanding, had sustained this judgement, and had sustained very high levels of pupil attainment and (where the data was available) progress over the past three years.
Good-to-great	Schools that are already doing well overall and in science, but are ambitious to develop even better science teaching and learning in their school and were using science to help them achieve this.	We selected schools that had been judged good by Ofsted and had sustained this or been judged outstanding, and had secured improvements in pupil attainment and (where the data was available) progress over the past three years.
Building the foundations	Schools that were aiming to put in place the building-blocks of a new and effective approach to science teaching and learning, and were accessing science CPD in order to do this.	We selected schools that had been judged to be less than good and had achieved an improved Ofsted judgement, and had secured improvements in pupil attainment and (where the data was available) progress over the past three years.

In addition to inviting these schools to take part in case study visits – in which 11 agreed to take part – we also analysed the data on the types of CPD that they had accessed from the Network. The table below summarises the patterns we identified in the most common types of Network CPD that these schools had accessed, and the differences between primary and secondary schools, and between schools at different stages of their improvement journey.

There were two areas of consistency among these 36 schools that we wanted to highlight. First, both primary and secondary schools at all stages of their journey were in the habit of using science CPD to respond to changes in national policy. For that reason, Network CPD courses and activities focusing on changes to the curriculum, assessment and qualifications featured prominently among the CPD activities these schools had accessed.

Second, in both the primary and secondary phases, schools that were at the *building-the-foundations* stage of their journey had focused the CPD they accessed from the Network on a number of key areas. In other words, their focus was on using Network CPD to put the building-blocks of a new, more effective approach to science teaching and learning in place. The type of building blocks differed between primary and secondary schools: the primary schools' use of CPD focused on developing a new, more enquiry-based approach to science, whereas the secondary schools' use of CPD was characterised by enhancing the subject-knowledge and skills of teachers and technicians. Interestingly, both primary and secondary schools that were *building the foundations* had also engaged in local clusters, network meetings and conferences within the Network. This suggested that these schools had recognised the importance of continuing to engage and connect with peers in local schools and with national developments.

Figure 27: Patterns of usage of Network CPD by schools at different stages of their improvement journey

	Primary	Secondary
Sustaining excellence	Developing subject leadership Curriculum and assessment Leading & delivering effective professional development	Curriculum and assessment Subject knowledge enhancement (particularly physics and chemistry) Leading & delivering effective professional development Local network and cluster meetings or conferences Teaching science at Key Stage 5 (biology, chemistry, physics) Careers in science Exam skills and linear assessments Skills for new and senior technicians
Good-to-great	Developing subject leadership Curriculum and assessment Essential enquiry / working scientifically Local network and cluster meetings or conferences Links with other subject areas – literacy, numeracy, ICT Science for children in the early years Leading & delivering effective professional development	Subject knowledge enhancement (particularly physics and chemistry) Triple science Curriculum and assessment Local network and cluster meetings or conferences Leading & delivering effective professional development Supporting students with special educational needs
Building the foundations	Essential enquiry / working scientifically Curriculum and assessment Local network and cluster meetings or conferences	Subject knowledge enhancement (particularly physics and chemistry) Skills for new and senior technicians Local network and cluster meetings or conferences

Both primary and secondary schools that were *sustaining excellence* and *good-to-great* were more likely to be accessing a wider range of science CPD from the Network and to be training staff to deliver CPD to their peers (through the Network's *leading & delivering effective professional development* course). There were, however, three important differences between primary and secondary schools.

First, what differentiated the primary schools that were *sustaining excellence* and some of those *good-to-great* was the focus on the role of the subject leader. As we found in our fieldwork, many subject leaders in primary schools were not science-specialists by background. What characterised *sustaining excellence* and *good-to-great* schools was that they were using Network CPD to equip (often new) subject leaders with the knowledge and strategic leadership skills to lead science teaching and learning effectively within their school. By contrast, what differentiated *sustaining excellence* secondary schools was their use of Network CPD to enhance teachers' subject knowledge, particularly in relation to Key Stage 5 science and in introducing cutting-edge developments in science into the classroom, and supporting students to pursue further study and careers in science.

Second, as noted above, *sustaining excellence* and *good-to-great* schools in both phases tended to have accessed a wider range of science CPD from the Network than schools that were *building the foundations*. Among the primary schools it was the *good-to-great* schools that appeared to be accessing the widest range of science CPD from the Network, whereas among the secondary schools it was the *sustaining excellence* schools. This further supports the idea that *sustaining excellence* among primary schools focuses on using science CPD to enhance subject leadership, while *sustaining excellence* among secondary schools is characterised by using science CPD to give extend the range of ideas, study opportunities and careers open to students.

Third, we also found that, among the primary schools, there were differences in the number of staff that accessed CPD from the Network at different stages of a school's journey. Specifically, among schools that were *building the foundations*, it was most common for one member of staff to access the CPD, while for *sustaining excellence* primary schools it was most common for two members of staff to access the CPD together. For *good-to-great* primary schools, the number ranged from one to four, with some (presumably larger) primary schools enrolling more than 10 members of staff on a single Network CPD activity. This supports the idea that *sustaining excellence* primary schools will tend to use science CPD to build leadership capacity, while *good-to-great* primary schools will tend to focus on accessing a wide range of new ideas through science CPD, and primary schools that are *building the foundations* will focus on getting the right building blocks securely in place. By contrast, we found no such pattern when we analysed the numbers of staff attending the CPD from the secondary schools. This varied from one member of staff to between four and six (presumably all staff in a particular department, such as biology) to, in one case 20 (presumably all staff teaching science in the school), but did not appear to be linked to the stage of the school's improvement journey in science.

Chapter 4: Conclusions and implications for educators involved in improving science teaching and learning

Through our evaluation, we have described the difference that science CPD from the National Science Learning Network and the National STEM Centre has made to primary and secondary schools across the country. In chapter 1, we explored the different levels of types of impact that schools engaging in CPD from the Network have seen. In chapter 2, we described what we have learned about how the most strategic users of science CPD maximise the impact on the CPD they access on science teaching and learning in their schools.

Aside from understanding what differentiates the approaches taken by schools that have sustained excellence or achieved significant improvements in science teaching and learning, we think that there are implications that can be drawn from this. Specifically, we consider that there are implications for school and subject leaders, for teachers and technicians, and CPD providers in terms of how they plan, embed, evaluate and sustain consistently high-quality and continuously-improving science CPD. We have couched these implications in terms of science CPD specifically, but they apply just as well to how schools use subject-specific CPD in other subject areas.

Figure 28 (below) captures what we see as the most important implications of this report, which are then explained in more detail in the remainder of this chapter. Some of these will be taking place already, and some will be obvious, but have been captured as reminders nonetheless.

Figure 28: Implications for school and subject leaders, teachers and technicians, and CPD providers in the Network about how they maximise the impact of science (and all subject-specific) CPD

	School and subject leaders	Teachers and technicians	CPD providers in the Network
Planning	Develop a clear plan for CPD, informed by honest self-evaluation and pick the right people to enthuse others.	Choose CPD that aligns your own professional development and the school's or department's strategic priorities – be selective.	Target the CPD offer at specific stages in a school's journey, and at particular stages in the development of teacher, technician or leader.
Embedding	Create regular opportunities not only to share, but to embed, CPD and support staff to plan and implement this in the classroom.	Set a target to achieve within a week of the CPD, including how you will influence at least one colleague's classroom practice.	Ensure CPD activities focus not only on what the participant will do differently, but on how they can support colleagues to do the same.
Evaluating	Be clear, in advance, about the difference you want to see from the CPD, how you will know, and then track impact in the classroom.	Be clear, in advance, about the difference you expect to see in your classroom – establish a baseline and check for improvements.	Continue to embed within CPD activities strategies for identifying evidence of impact of CPD on teaching and learning.
Sustaining	Celebrate success and create a cycle of continually evaluating and improving practice to foster a learning culture in your school.	Seek out opportunities to report on effective new practices to colleagues, leaders, governors and peers in other schools.	Foster subject-specific collaboration between schools through Science Learning Partnerships and cluster-based approaches.

Implications for school and subject leaders

Plan: Develop a clear plan for science CPD and pick the right people to lead it

The most strategic users of science CPD start by having a clear plan about what subject-specific CPD they want to access. This is informed by robust data analysis, feedback from pupils and staff, and frank self-evaluation about the strengths and areas for development in the school's approach to science, as well as the development needs of individual members of staff. The science CPD that the school chooses to access is then aligned closely to these priorities.

Embed: Create regular opportunities to share and support staff to implement their learning

All school and subject leaders agreed about the importance of implementing subject-specific CPD learning effectively to inform classroom practice, but not all schools thought they did this effectively (or, in a very few cases, at all). The most effective schools established regular routines for sharing learning and improving teaching practice, including both fast-paced "speed CPD" and more in-depth reflection and collaborative planning. Schools need to find the right way in which to share and embed science CPD among other, competing pressures on time, but not doing so risks wasting the time and resources invested in accessing the CPD in the first place.

Evaluate: Be clear, in advance, about the difference you expect to see from the science CPD and then track it

Without clarity in advance about the difference the school expects to see following science CPD, there is very little opportunity to identify what is working well and what needs to be refined. This in turn can limit the effectiveness of a new teaching idea, drawn from the CPD, and restrict the potential benefits to pupils. For school and subject leaders, the implication is, when planning science CPD, to support and encourage staff to reflect on what they plan to do differently as a result of accessing the CPD and how they would know this was making a difference to them, to their peers, and to their pupils' learning.

Sustain: Celebrate success and create a cycle of continually evaluating and improving

The most strategic users of science CPD did not see the CPD they planned and accessed as a one-off, but rather they saw this as part of an ongoing cycle of planning, embedding, evaluating and refining. Through this cycle, they sought to inculcate a learning culture in their school in which staff felt emboldened and empowered to try new things and access new ideas. The implication for school and subject leaders is to consider how they can foster this culture in their schools.

Implications for teachers and technicians

Plan: Choose science CPD that aligns your development and the school's priorities

Some of the teachers and subject leaders we spoke to told us that it could be difficult to get agreement from senior leaders to undertake subject-specific CPD. Selecting science CPD that meets both personal development goals as well as key school and subject improvement priorities will help not only to gain the support of senior leaders. As we described in chapter 2, this will also offer teachers and technicians greater opportunities to disseminate learning and evaluate impact. There is a role for school and subject leaders to play in setting and communicating clear priorities for science CPD, but there is also a role for teachers and technicians to use their own development needs and interests to shape the improvement priorities for the school and vice versa.

Embed: Set targets for implementing learning and disseminating this to colleagues

One science teacher told us that the two-week period after participating in a subject-specific CPD activity was critical: doing something to implement what had been learned during those two weeks would reap benefits, while leaving it longer than two weeks and those benefits and the learning would be lost. Given that the importance of disseminating learning has been a central theme of this evaluation, it is vital that the immediate post-CPD period includes steps to share learning and begin to embed that within colleagues' teaching practice.

Evaluate: Set a baseline so you can the difference the science CPD is making in your classroom

Schools are rich in data about pupils' learning. Teachers and technicians in schools that were the most strategic users of Network CPD were effective evaluators of impact not because they invented new, parallel processes for tracking the impact of science CPD. Instead, they were strategic users because they harnessed existing processes to establish a baseline before accessing the science CPD so that they could look for evidence that the CPD was making a difference afterwards.

Sustain: Seek out opportunities to report on effective new practices to governors and peers

The most strategic users of Network CPD seek to create and sustain a learning culture in their school to maximise the impact of the science CPD that they access and improve science teaching and learning continuously. School and subject leaders have an important part to play in fostering this culture. Likewise, teachers and technicians can play a key role by pro-actively seeking out opportunities to share successful new practices with their colleagues, with peers in other subject areas and partner schools, and with school leaders and governors.

Implications for CPD providers in the Network

Plan: Target the Network's CPD offer at specific stages of a school's journey

In our fieldwork, subject leaders told us that one of the things they valued most was when subject-specific CPD was marketed with very clear learning outcomes. This helped subject leaders to identify the subject-specific CPD that fitted best with the school's strategic priorities and make the case to the school's leadership. In chapter 2, we have described the different forms of science CPD that primary and secondary schools have accessed from the Network at different stages of their improvement journey. This presents opportunities for the Network to differentiate the way they plan and promote their science CPD programme, and to target it much more closely at the specific needs of schools at different stages on their improvement journey.

Embed: Ensure Network CPD activities focus on how participants can support colleagues to change their practice

One of the key features of the Network's science CPD is that a framework for evaluating the impact of science CPD is embedded within the CPD activities and through the impact toolkit. All school and subject leaders that took part in this research agreed that the key to maximising the impact of science CPD was the way learning was disseminated and new ideas embedded within teaching practice right across the school. As one school leader put it, 'the potency of any isolated CPD is determined by the community of learning.' As such, we consider that there is an opportunity to reinforce within the way the Network's CPD is planned a framework to support CPD participants to reflect on how they will use CPD, not only to change their own practice, but also specifically how to influence that of their peers.

This evaluation has suggested that there would be value in the Network's CPD setting out ways to do this through regular routines that provide time for hands-on testing and collaborative reflection so that opportunities for spreading new ideas beyond a single classroom are not lost.

Evaluate: Continue to embed support to evaluate impact of CPD within Network CPD activities

The impact toolkit provides a valuable means to support and encourage CPD participants to plan, reflect on and evaluate the difference that the Network's CPD they have accessed has made in their classroom and across their school. Nevertheless, we found comparatively fewer schools were strategic users of CPD when it came to evaluating impact. This was particularly the case among secondary schools. Among primary schools, we have noted that there were a higher proportion of schools that adopted a strategic approach to evaluating subject-specific CPD. Furthermore, we have also found that schools on the *sustaining excellence* and *good-to-great* stage of their journey were more likely to access Network CPD focusing on developing the role of the subject leader. This CPD has a strong focus on evaluating impact and using data, which suggests that primary schools accessing this CPD from the Network were also more confident in knowing how to evaluate the impact of other CPD that their school has accessed from the Network.

Where schools were not taking as strategic an approach to evaluating subject-specific CPD as they may have wished, most often a lack of time was cited as factor. In other instances, however, subject leaders were not certain how they would go about identifying evidence of impact of CPD on pupils' learning. We consider that there is a role to be played by all those involved in facilitating CPD activities across the Network, from the National Science Learning Centre and the National STEM Centre throughout the 51 science learning partnerships, to reinforce continually to CPD participants how they can identify evidence of the difference that CPD is making in the classroom.

Sustain: Foster subject-specific collaboration

Some of the most strategic users of science CPD, at all stages of their improvement journey, were involved in local science networks, clusters or partnerships within the Network. Subject leaders saw this as one important channel through which new ideas and practices were brought into the school and used to improve science teaching and learning. Many also saw this as an opportunity to develop the leadership skills of their staff and to build the leadership capacity of the school. In some schools, this was part of a deliberate strategy to recruit and retain excellent science teachers, or was part of an overarching vision to improve science teaching and learning in their local community and beyond their own school. Whatever the reasons might be in an individual school, all agreed that subject-specific networks and collaborative activities brought manifold benefits to the school, to staff and ultimately to pupils' learning. Several schools welcomed the development of the science learning partnerships. For these reasons, we think the Network should continue to support the science learning partnerships to play an important role in providing high-quality local science CPD, as well as encouraging schools to develop local clusters and other collaborative ventures.

Annex A: Survey questions for science leaders in schools

YOUR SCHOOL'S APPROACH TO SCIENCE CPD

Please answer the questions below using a scale of 1-4, 1 being very high and 4 very low. For any questions, if you are not able to answer, please mark as not applicable (N/A).

No.	Question	1	2	3	4	N/A
A	How much importance is given to CPD in general in your school?					
B	Within that, how much importance is given to science-specific CPD in your school?					
C	How clear was your school about why it accessed the National Science Learning Network CPD you have accessed?					
D	How much support do staff get when they return from science-specific CPD to implement what they have learned and make changes to their practice?					
E	How much expectation is there that staff will share their learning with their colleagues formally and use this to shape department-wide practices?					

THE IMPACT OF THE CPD YOUR SCHOOL HAS ACCESSED FROM THE NATIONAL SCIENCE LEARNING NETWORK

Using the same scale, with 1 being very high and 4 very low, what has been the level of impact of the National Science Learning Network CPD you have seen on the following?

No.	Question	1	2	3	4	N/A
F	<u>Participants in the CPD</u> (motivation and confidence, knowledge and skills, practice, quality of teaching)					
G	<u>Their direct colleagues</u> (knowledge and skills, practice, quality of teaching)					
H	<u>Science staff progression and retention</u>					
I	<u>Pupils</u> (engagement, mastery of specific skills, achievement and progress)					
J	<u>Other schools with whom you work</u>					

FINAL QUESTIONS

If you have any other comments to make about the science CPD your school has accessed through the National Science Learning Network – such as any specific examples of CPD that has a significant impact in your school or any examples of good practice in implementing and sharing the learning from science CPD – please give a brief description of this in the space below.

Do you or staff at your school access online resources from the National STEM Centre? How have these been used in your school?

What are your future plans for accessing science CPD? Are there any specific science CPD activities you would like your school to access in future?

Annex B: Grid use to score schools' approach to science CPD

As we explain in the introduction to this report, we used this grid to capture judgements about the approaches to planning, embedding and evaluating science CPD in the 59 schools whose science leaders we interviewed during the autumn term of 2014 and the spring term of 2015. We used this information to test whether we could draw conclusions about the characteristics of schools that took a more strategic or planned approach to science CPD and to identify examples of good practice from which we could develop case studies.

	Planning	Embedding	Evaluating
1: Strategic users	Strong strategic planning that goes beyond the individual and is strongly driven by school / departmental needs	Strong support and routine processes for participants to implement, share and embed CPD learning	Clear strategy and processes for baselining and tracking most types of impact
2: Planned users	Well-planned CPD, but largely driven by individual staff needs through a well-run performance management system	Some support to participants to implement and share, mostly semi-formal sharing	Some strategy and processes for tracking impact, some understanding of how this is done
3: Semi-planned users	Loosely-planned CPD – slightly hit-and-miss in the way appraisal used to generate CPD choices, heavily influenced by “what is in the brochure”	Little support to participants, entirely informal sharing	No specific and explicit processes for tracking the impact of CPD, little understanding of how to track impact of CPD
4: Ad hoc users	Ad hoc – no clear rationale or links to annual planning processes	No process for sharing and no explicit support	No strategy, not clear how to track most types of impact