Coloma Primary Science Project Evaluation Final Report

Project Oracle: Level 2

Report Submission Deadline: Round 2 - 30 September 2015

Report Submission: Final Report to the GLA / Rocket Science

Project Name: Coloma Primary Science project

Lead Delivery Organisation: Coloma RC Convent School

London Schools Excellence Fund Reference: 067

Author of the Self-Evaluation: Dr Sara Bubb

Total LSEF grant funding for project: £75,000

Total Lifetime cost of the project (inc. match funding): £ £83,000

Actual Project Start Date: Jan 2014

Actual Project End Date: 20/7/2015

1. Executive Summary

This report is an evaluation of the Coloma Primary Science Project, which involved 38 primary teachers from 26 schools in six boroughs (Croydon, Bromley, Merton, Lewisham, Lambeth and Southwark).

The project met its objective, which was to improve the subject knowledge and skills of primary teachers, to enable them to teach the new Science curriculum and disseminate their learning to their colleagues. This requirement arises because the new Science curriculum is a challenge for many primary teachers, with new topics such as evolution and inheritance, fossil formation, the digestive system, gears, levers and pulleys, and a greater emphasis on identifying and classifying plants and animals.

Evidence was gathered using the following methodology:
i) questionnaires to participants before and after the project;
ii) questionnaires to headteachers at the end of the project;
iii) questionnaires to participants after each of the training sessions and in-school visits;
iv) interviews with participants;
v) pupils' work scrutiny;
vi) audits of science displays throughout the school at the beginning and end of the project; and
vii) visits to the project schools.

Project evaluation findings were:

- Primary teachers' Science knowledge was lower than expected. Only six out of 28 teachers had studied any Science subject beyond the age of 16. All participants were given a Key Stage 3 Science test and the scores ranged from 37% to 83%, with a third achieving less than 50%.
- Participants' knowledge and understanding of science were tested at the start and end of the project: the average of their scores improved by 21%.
- All participants felt more confident in teaching Science and considered that they taught the subject better. This was independently confirmed by their headteachers.
- The teachers said that their pupils had made more progress and 29% of them judged that there had been 'much more' progress. The accuracy of these judgements was borne out by their headteachers, pupil focus groups, and the work moderation that the teachers themselves did at one of their sessions.
- The improvement in the teachers' confidence was striking: all said they were more confident as a result of the project and 52% said they were 'much more'.
- When the teachers were asked about the impact of the project, all said their pupils had made "more" or "much more" progress as a result of the project.
- Participants made huge strides in developing their leadership skills with 63% saying they had made 'much more' progress. Headteachers also rated the project highly, giving 100% positive scores for improvement in teachers' confidence, Science teaching and leadership.

- Participants in 4 out of every 5 schools considered that there were not enough resources to teach the curriculum. The project provided a range of resources, which significantly aided participants' progress.
- As a result of the project, Science had a greater status in all the schools. All headteachers judged the project to have raised the status of Science and a third considered that it was 'much more' (see Figure 8). One headteacher said, "Science has been re-energised in the school".

The teachers enjoyed the project, and benefitted a great deal, as this comment from an experienced teacher illustrates:

> *The project has had a huge impact on me. It has been hard not to get caught up in the sheer enthusiasm of the presenters. Suddenly everything seemed to fall into place, plain English was used and connections were made with the real world.*

2. Project Description

This project aimed to:

- Inspire teachers, and deepen their knowledge and understanding of science
- enable participants to teach the new primary science curriculum with confidence
- develop participants' leadership skills, to generate impact beyond their classroom

Ultimately, children should accelerate their progress in science, as a result.

Science has become a Cinderella subject in the primary curriculum. Although a core subject, its status in many primary schools has fallen significantly in relation to English and mathematics since the national testing of it stopped. Ofsted found that 'In nearly half of the primary schools visited, senior leaders were not setting targets for science and were not tracking pupils' progress in the subject. This was because they no longer saw science as a priority, despite its place as a core subject in the National Curriculum' (Ofsted, 2013, p5). They also found that science was much more likely to be outstanding when teachers and subject leaders had received science-specific training (Ofsted 2013, p6).

Science has undergone significant changes in the new National Curriculum. It is a subject which can excite children and teachers, and provide children with a vital platform for developing English and maths. The project was set up because the new Science curriculum is a challenge for many primary teachers: this is because few of them have studied the subject beyond the age of 16, so that their own knowledge and understanding of topics such as evolution and inheritance; fossil formation; the digestive system; and gears, levers and pulleys are often limited.

Project background

The project did not go to plan in the first year because it started late and time for training was limited. There were 10 (not 20) teachers from five schools in Croydon and four 2-3 hour sessions took place, with attendance varying from four to nine.

In the second year, Dr Sara Bubb (the bid writer) took over the project leadership. More people were recruited: 28 teachers from 21 schools in six boroughs (Croydon, Bromley, Merton, Lewisham, Lambeth and Southwark). Once on this sound footing, the project had these elements:

- 11 half day training sessions to improve knowledge in topics where teachers lacked confidence such as Working Scientifically, Electricity, Rocks, Earth and Space, Evolution and Inheritance, and Light.
- Termly visits by a consultant to each school
- Resources for each school – 3 Science books, 1 leadership book; digestive system mat; up to £400 per school to choose their own resources; and for those who needed them, a rock box and microscope.

The project confirmed the

i) need to augment the Science knowledge and skills of primary teachers to meet curriculum demands

ii) immediate benefit – in both confidence and outcomes – to teachers and pupils of specific training intervention
iii) benefit to whole-school learning of improved leadership in Science
iv) importance of commitment from headteacher/SLT level.

2.1 Does your project support transition to the new national curriculum?

Yes, the project supports the transition to the new primary science curriculum.

2.2 Please list any materials produced and/or web links and state where the materials can be found. Projects should promote and share resources and include them on the LondonEd website.

Article on the LondonEd website.

http://www.exciteprimaryscience.org/201415.html

3. Theory of Change and Evaluation Methodology

Please attach a copy of your validated Theory of Change and Evaluation Framework.

..\Updated Coloma Primary Science LSEF067 Evaluation framework Sara Bubb.docx

Coloma Theory of change v2.docx

3.1 Please list **all** outcomes from your evaluation framework in Table 1. If you have made any changes to your intended outcomes after your Theory of Change was validated please include revised outcomes and the reason for change.

Table 1- Outcomes

Description	Original Target Outcomes	Revised Target Outcomes	Reason for change
Teacher Outcome 1	Increased subject knowledge and greater awareness of the new primary science curriculum	Same – for 24 teachers	Aimed for 18, got 24
Teacher Outcome 2	Increased teacher confidence	Same – for 24 teachers	Aimed for 18, got 24
Teacher Outcome 3	Delivery of higher quality teaching including subject-focused and teaching methods	Same – for 24 teachers	Aimed for 18, got 24
Teacher Outcome 4	Use of better science-specific resources	Same – for 24 teachers	Aimed for 18, got 24
Pupil outcome 1	Increased educational attainment and progress in Science	Same – for 24 teachers' classes	
Pupil outcome 2	Increased pupil interest in Science	Same	
Wider system outcome 1	Science has a greater status in project schools	Same – for 18 schools	Aimed for 18, got 24
Wider system outcome 2	Improved leadership of Science	Same – for 24 teachers	Aimed for 18, got 24

3.2 Did you make any changes to your project's activities after your Theory of Change was validated?

No.

3.3 Did you change your curriculum subject/s focus or key stage?

No.

3.4 Did you evaluate your project in the way you had originally planned to, as reflected in your validated evaluation plan?

Yes.

4. Evaluation Methodological Limitations

4.1 What are the main methodological limitations, if any, of your evaluation?

a. The online surveys were kept very simple and quick (2 minutes) to complete, but even so it required much effort to get anywhere near 100% response rates.

b. It is hard to assess "confidence" objectively. In a questionnaire, the teachers were asked what year groups they had taught and how confident they felt in specific Science topics. As Appendix 1 shows, the group responses were mixed: for instance, in both "Rocks" and "Evolution & Inheritance" someone felt "very confident" and someone else very "unconfident".

c. To assess subject knowledge, the participants in year two of the project were given a key stage 3 science paper to test their knowledge at the beginning and end of the project. This gave clear benchmarking and showed how extensive and deep gaps in knowledge were, which incentivised some participants to greater awareness of the need for self-study. It enabled sessions on specific science topics to be tailored to meet areas of misunderstanding and lack of knowledge. Limitations however included:

- some teachers were stressed about doing a test; others enjoyed it.
- A few elements of the test demanded the use of some simple arithmetic, which many of the teachers found challenging
- the test only covered a selection of the topics likely to be encountered in the new Science curriculum.

d. On a practical note, test administration was more time-consuming than expected, and in particular a great deal more time was required for marking and moderation. We had planned to evaluate the difference in quality of teaching by carrying out two lesson observations of 20% of the participants, but this proved very difficult to organise and costly. It was hard to make firm judgements about any improvement in the quality of teaching when there were so many other variables. We did make some lesson observations, but we found that discussions about planning, children's work, and displays more useful in showing the difference in teaching quality.

e. Pupil achievement and progress are currently hard to measure in science because of the changes to the national curriculum and assessment requirements. Schools are using different schemes through which to teach science and there are no consistent assessment tools. Although there are no meaningful quantitative measures, there is nevertheless a lot of qualitative data gathered through scrutinising children's work in science and through pupil focus groups.

f. Participants were encouraged to judge and evidence their own progress against the targets they had set themselves and the action plans that they had drawn up. This was a very valuable process for the participants. It was nevertheless a complex input for overall project evaluation, because while everyone clearly made progress, some targets were more ambitious than others and all judgements were subjective. This was addressed by triangulating the findings, through surveying headteachers,

discussion with the participants, and visits to their schools. We found that, broadly speaking, the teachers tended to underplay their achievements and successes.

g. We did not have a control group, although this is partly compensated by our use of objectively comparable "before" and "after" testing.

4.2 Are you planning to continue with the project, once this round of funding finishes?

Yes, we are planning to continue with the project – see www.exciteprimaryscience.org

We will evaluate impact in an even more rigorous but also simpler way. We will use a test that assesses science knowledge in a manner more closely related to the topics of the curriculum that we intend to cover. This test will be done at the beginning and the end of the project to see whether teachers have improved their knowledge and can apply their understanding.

We will continue to ask the participants to set individual targets and draw up action plans that are relevant to their own respective contexts – and then to measure their own progress. Although this results in a great deal of variation within the project it is empowering for the individual teachers, and gives them responsibility for implementing the knowledge and ideas from the project.

We will continue to conduct online evaluations that ask not only about the overall usefulness of the training, but also what the teachers have done or intend to do as a result. This has been particularly successful to date. We will seek the views of headteachers, not only at the end of the project but halfway through, in order to ensure that their voices inform the project.

Participants will be encouraged to decide on ways of measuring their own pupils' progress – it is important in this context that they conceptualise the project as a scheme of self-empowerment, rather than as a received "how-to" guide.

5. Project Costs and Funding

5.1

Table 2 - Project Income

	Original[1] Budget	Additional Funding	Revised Budget [Original + any Additional Funding]	Actual Spend	Variance [Revised budget – Actual]
Total LSEF Funding	75,000		-	75,000	0
Other Public Funding	0	0	-	0	0
Other Private Funding	0	0	-	0	0
In-kind support (e.g. by schools)	8,000	0	-	8,000	0
Total Project Funding	83,000		-	83,000	0

List details of in-kind support below and estimate value.

- Training room for 11 half day sessions = estimated value £3,000
- Teacher cover – the project paid schools £50 per teacher per half day to release them for training or in-school support, but the real cost of cover was higher.

Table 3 - Project Expenditure

	Original Budget	Additional Funding	Revised Budget [Original + any Additional Funding]	Actual Spend	Variance Revised budget – Actual]
Direct Staff Costs (salaries/on costs)					
Direct delivery costs e.g. consultants/HE (specify)	12,000			18,558	+6,558
Management and Administration Costs	6,500			12,060	+5,560

[1] Please refer to the budget in your grant agreement

	Original Budget	Additional Funding	Revised Budget [Original + any Additional Funding]	Actual Spend	Variance Revised budget – Actual]
Training Costs	21,000			10,972	-10,028
Participant Costs (e.g. Expenses for travelling to venues, etc.)	0			0	
Publicity and Marketing Costs	1,000			2,079	+1,079
Teacher Supply / Cover Costs	20,000			16,050	-3,950
Resources	10,000			10,780	+780
Evaluation Costs	4,500			4,500	0
Others as Required – Please detail in full					
Total Costs	75,000			74,999	-£1

5.2 Please provide a commentary on Project Expenditure

The project delivered a great deal of value and the budget was spent wisely. In the second year, there were 11 high quality training sessions for up to 28 teachers and termly visits to the participants in their schools, which incentivised and facilitated impact considerably.

Direct delivery costs e.g. consultants – this was for termly in-school support by consultants.

Management and Administration Costs – Project management took much more time than had been foreseen. The LSEF meetings and reporting requirements took much longer than anticipated when the bid was written.

Training Costs – this was for the three Science and Leadership consultants to run 11 training sessions, plus refreshments.

Publicity and Marketing Costs – £1,000 was spent on writing articles from the project and £1,079 was spent, with LSEF agreement, on developing a website to enable the continuation of the project for the forthcoming year without further LSEF funding support.

Teacher Supply / Cover Costs – £50 was paid to the schools for each teacher per session attended or to release them for the consultant's visit.

Resources – each school received 3 Science and one Leadership books, a digestive system mat and membership of the Association of Science Education (ASE) for one year. Schools could additionally request up to £400 for resources; and buy a microscope and/or a rock box at a reduced price.

6. Project Outputs

Table 4 – Outputs

Description	Original Target Outputs	Revised Target Outputs [Original + any Additional Funding/GLA agreed reduction]	Actual Outputs	Variance [Revised Target - Actual]
No. of schools	10	20	24	+4
No. of teachers	40	30	38	+8
No. of pupils	1,200	900	1,083	+183

It was surprisingly difficult to recruit schools to the project. Rather than seeing it as an opportunity to be seized, many headteachers said that they would not be happy to have their teachers away from their classes for eight afternoons, and they were sceptical about whether teachers would want to attend training on the three Saturday mornings that were planned. Science was not a subject on many schools' development plans, so that they were less happy for such training to take place than they would have been had it concerned English or mathematics: it seemed to them a luxury to do this for science.

We addressed the low take-up in Croydon by opening it up to surrounding local authorities and using word-of-mouth to inform potential recruits: in consequence, we had a pleasing number and spread of schools involved in the second year.

There was "churn" of teachers leaving or joining in the second year:

- One teacher left at Christmas 2014 because she moved to a new school and LA. Her place was taken by a colleague.
- One teacher left in January 2015 because she left her school.
- Two teachers left in February 2015 due to their headteachers wanting their focus to only be English and Mathematics.
- Two new teachers from two different schools joined the project in January 2015 because they had heard how good it was.

The sessions were evaluated by the teachers using a 4 point Likert scale for judging them to be great, good, okay, or a waste of time. As Table 1 below shows, almost all sessions were considered either good or great, with 10 out of the 11 sessions being deemed "great" by the majority of participants.

Figure 1: Participants' evaluations of the 11 sessions (Oct 2014-June 2015)

Sessions	Great 1	Good 2	OK 3	Waste of time 4	*Mean* (1-4)	Standard deviation
Introduction	23%	77%	0%	0%	1.77	0.42
Working scientifically 1	61%	33%	6%	0%	1.44	0.60
Working scientifically 2	80%	15%	5%	0%	1.25	0.54
Electricity	81%	19%	0%	0%	1.19	0.39
Animals including humans	61%	39%	0%	0%	1.39	0.49
Earth and space	63%	37%	0%	0%	1.37	0.48
Rocks and soils. Fossils	81%	19%	0%	0%	1.19	0.39
Evolution and inheritance	67%	33%	0%	0%	1.33	0.47
Horniman Museum	67%	33%	0%	0%	1.33	0.47
Outdoor learning Plants	56%	44%	0%	0%	1.44	0.44
Light. Achievements	81%	19%	0%	0%	1.19	0.39

Termly visits were made to the schools, and these too were scored extremely highly, with 80% considering them 'great'. The visits to the schools made a crucial difference to the project impact. Although expensive, this form of coaching in the participants' own context levered up the scale and reach of participants' activities so that they made an impact beyond their own classroom. Here are typical comments:

> *Having ongoing support sessions at different points in the course [was] really helpful to give me direction, reassurance and help me have wider whole school impact.*
>
> *It helped me to have a date when I knew someone would be coming in to monitor things: this helped me plan what I was going to do with release time and give greater purpose to what I was asking others within the school to do.*

7. Key Beneficiary Data

7.1 Teacher Sub-Groups (teachers directly benefitting counted once during the project)

The teachers directly benefiting from the project are those who attended the training sessions. However, because they also aimed to raise the status of science in their respective schools, they also had an impact on other teachers.

Table 5 – Teachers benefitting from the programme

	No. teachers	% NQTs (in their 1st year of teaching when they became involved)	% Teaching 2 – 3 yrs (in their 2nd and 3rd years of teaching when they became involved)	% Teaching 4 yrs + (teaching over 4 years when they became involved)	% Primary (KS1 & 2)	% Secondary (KS3 - 5)
Project Total	38	18	18	64	100	0
Year 1	10	18	18	64	100	0
Year 2	28	14	29	67	100	0

7.1.2 Please provide written commentary on teacher sub-groups e.g. how this compares to the wider school context or benchmark *(maximum 250 words)*

The teacher sub-groups are broadly typical of London boroughs. There were between 3 and 6 teachers from each primary year group, which meant that people could easily work in trios.

7.2 Pupil Sub-Groups

The pupils directly benefitting are those who were taught by the teachers involved in the project. In most cases this was just one class in primary school, but some participants taught science to other people's classes within the school.

Some 9,850 children benefitted indirectly because of the participants' leadership role in the schools. Although it is self-evident that a great many additional pupils will benefit in future years from the enhanced knowledge and capability of the teachers trained by the project, we are not able to forecast their numbers.

Tables 6-8 – Pupil Sub-Groups benefitting from the programme

	No. pupils	% LAC	% FSM	% FSM last 6 yrs	% EAL	% SEN
Directly benefitting	1,105	2	22	28	31	21

	No. Male pupils	No. Female pupils	% Lower attaining	% Middle attaining	% Higher attaining
Directly benefitting	550	555	23	47	30

	% Asian Indian	% Asian Pakistani	% Asian Bangladeshi	% Asian Any Other	% Black Caribbean	% Black African	% Black Any Other Background	% Mixed White &	% MixedWhite & Black	% MixedWhite & Asian	% MixedAny Other	% Chinese	% Any other ethnic
Directly benefitting	0	3	0	10	20	23	7	3	0	0	0	0	15

	% White British	% White Irish	% White Traveller	%	% White Any Other
Directly benefitting	10	0	0	0	15

7.2.1 Please provide a written commentary on your pupil data e.g. a comparison between the targeted groups and school level data, borough average and London average *(maximum 500 words)*

Useful links: London Data Store, DfE Schools Performance, DfE statistical releases

As a teachers' professional development initiative, the project did not target pupils, whether individually or as groups. It was not part of our methodology to recruit teachers to the project in accordance with either their respective schools' characteristics, or those of the pupils whom they taught. Pupil characteristics were broadly representative of the schools involved with the project, and the boroughs in which they were located: given the relatively low sample size and the non-random selection procedure, this is as expected.

8. Project Impact

8.1 Teacher Outcomes

Date teacher intervention started: March-June 2014; Sept2014-July 2015

24 teachers completed the full year: 21 female, 3 male; 3 NQTs; 4 in 2-3rd year of teaching; 17 with more experience.

The profile of respondents was broadly representative of the population as a whole.

Table 9 – Teacher Outcomes: teachers benefitting from the project

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
Increased subject knowledge and greater awareness of the new primary science curriculum	KS3 Tests Questionnaire to teachers.	24 responses, which is 100% of participants at the end of Year 2. 21 female, 3 male; 3 NQTs; 4 in 2-3rd year of teaching; 17 with more experience.	1-7 scale of (7 high) 1-4 scale (1 much more confident, 2 more confident, 3 same, 4 not sure)	September 2014 Test scores 37% to 83% Working scientifically 4.78 Plants 4.91 Living things 5.08 Animals 5.09 Seasonal changes 4.82 Materials 5.16 Sound 4.61 Earth and space 4.30 Forces 4.57 Rocks 3.86 Evolution and inheritance 4.05 Light 4.77 Electricity 4.43	26 June 2015 Test scores 52% to 96% Key findings Summarised below

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
Increased teacher confidence	Questionnaire to teachers. Discussion. Also, questionnaire to headteachers	24 responses which is 100% of participants at the end of Year 2	Sep 14 How much do you enjoy Science lessons? 1-7 scale (7 high) July 15 How much more do you enjoy Science lessons? 1-4 scale (1 high)	September 2014 Mean 5.4	June-July 2015 Enjoyment Mean 1.29 Confidence mean 1.48 on 1-4 scale (1 high) Key findings summarised below
Delivery of higher quality teaching including subject-focused and teaching methods	Questionnaire to teachers. Discussion. Also, questionnaire to headteachers	24 responses which is 100% of participants at the end of Year 2. 21 female, 3 male; 3 NQTs; 4 in 2-3rd year of teaching; 17 with more experience.	1-4 scale (1 much more, 2 more, 3 same, 4 not sure)	September 2014	June-July 2015 Key findings summarised below
Use of better science-specific resources	Questionnaire to teachers. Visits to schools. Resource audits. Discussion. Also, questionnaire to headteachers		1-4 scale (1 much more, 2 more, 3 same, 4 not sure)	September-October 2014	June-July 2015 Key findings summarised below

Outcome – Increased subject knowledge and greater awareness of the new primary science curriculum

Only six out of the 28 teachers had studied science beyond the age of 16. We wanted to benchmark the group's subject knowledge objectively, so all participants were given a test at the beginning and end of the project:

- In the first test, scores ranged from 37% to 83% - the mean was 62.1%.
- In second test, scores ranged from 52% to 96% - the mean was 74.9%.

We also asked participants to rate their confidence in teaching specific Science topics on a scale of 1-7, where 7 is very confident – the result are shown in Figure 2. There were particular insecurities around physical processes such as rocks, electricity, evolution & inheritance and working scientifically, which is a fundamental component of the new curriculum.

Figure 2: How confident participants felt at the start of the project on a scale of 1-7 (7=very confident) (n=28)

Confidence in topics	Mean	Standard Deviation
Working scientifically	4.78	1.14
Plants	4.91	1.16
Living things	5.08	1.08
Animals	5.09	1.06
Seasonal changes	4.82	1.11
Materials	5.16	0.92
Sound	4.61	1.05
Earth and space	4.30	1.37
Forces	4.57	1.06
Rocks	3.86	1.42
Evolution and inheritance	4.05	1.30
Light	4.77	1.04
Electricity	4.43	1.28

The 11 three-hour interactive practical training sessions spread out over the year addressed topics that the teachers themselves had identified as challenging, such as Working Scientifically, Electricity, Rocks, Earth and Space, Evolution and Inheritance, and Light. The teachers enjoyed it a lot, and benefitted a great deal.

> *The project has had a huge impact on me. It has been hard not to get caught up in the sheer enthusiasm of the presenters. Suddenly everything seemed to fall into place, plain English was used and connections were made with the real world.*

By June, the group averaged a 21% improvement in their Science test scores. All members felt more confident in teaching Science and considered that they taught the subject better. The teachers said that their children had made more progress and 29% judged that there had been 'much more' progress. The accuracy of these judgements was borne out by their headteachers, pupil focus groups, and the work moderation that the teachers themselves did at one of their sessions.

Outcome – Increased teacher confidence

Teachers were asked at the start and end of the project to say how confident they felt in different aspects of teaching Science. The improvement in the teachers' confidence was striking: all said they were more confident as a result of the project and 52 per cent said they were 'much more' confident.

This confidence had a direct impact on their teaching as the following comments illustrate,

> *The increase in my subject knowledge and access I have had to new ideas and resources have made me far more confident.*
>
> *I really enjoy science lessons because I am more confident with my subject knowledge and my teaching strategies.*

All the headteacher respondents considered that the participants were more confident with a third judging them to be 'much more' confident.

Outcome – Delivery of higher quality teaching including subject-focused and teaching methods

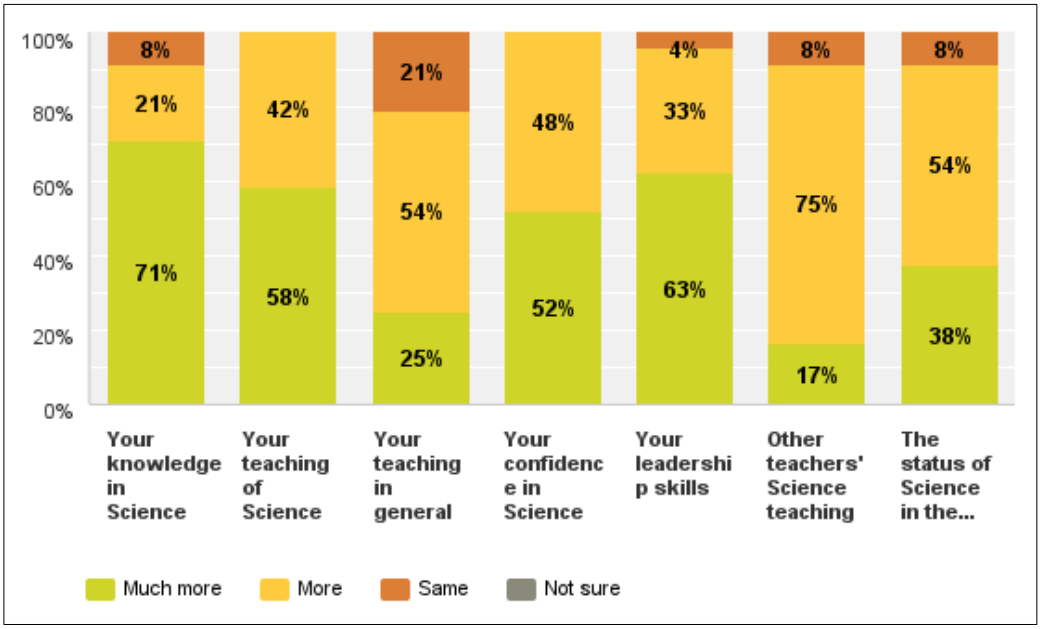
As Figure 3 shows, all of the participants considered that there had been an improvement in their science teaching with 58% saying that it was much better. Headteachers also noticed improvements in the participants' teaching of science, with 93% saying that there had been progress and 29% saying that there was much more progress. An experienced teacher said that his teaching style had changed:

> *More interactive lessons where their [children] ideas are expressed and shared as part of the process: more interaction with me and the children in exploring ideas compared with previous 'one way' system of me trying to get the facts over.*

This had an impact on the children because, as one teacher said,

> *My Science teaching is now far better and the children see how enthusiastic I am and are always really keen to try things I have been learning on my course.*

Figure 3: Participants' evaluation of how much progress they had made as a result of the project (July 2015 n=24)



Participants identified specific improvements in their Science teaching, including their planning and assessment. One, for instance, said, "I am more confident at planning activities that will help to assess children's progress". Observations identified more experimentation, greater excitement and enthusiasm, and wider use of appropriate resources and real world relevance.

The improvement in teaching was not restricted to Science: four-fifths (79%) of participants considered that the project had improved their teaching in general and a quarter considered that they had made much more progress in their generic teaching skills (see Figure 3). One very experienced teacher said,

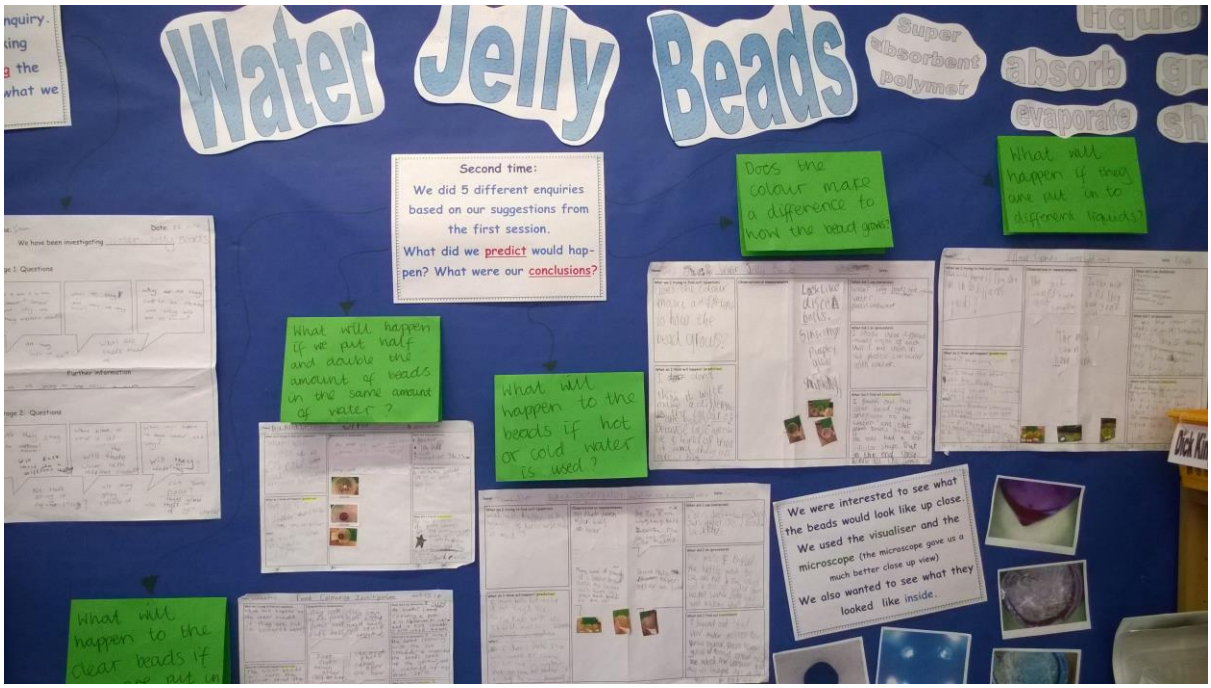
> *The more interactive style and questioning etc has influenced my teaching style back to a more constructive and creative one.*

Following an early session on working scientifically, one teacher used an experiment that had been done in the session with her class but extended it because of children's enthusiastic ideas for testing different variables. A large and interactive display was made about which children spoke passionately. This sparked interest from other teachers and children in other classes.

Some teachers encouraged children to act out a scientific process, filmed this and then used the videos for other children to discuss and learn from. Literacy and numeracy improved: for instance, scientific vocabulary was included in displays (see Figure 4), in spelling lists, handwriting practice and within the children's science books.

The teachers in the project made huge strides in developing their leadership skills, with 63% saying they had made much more progress. The only person who responded that they had not made progress in developing leadership skills was somebody who had no leadership role. Other teachers in the project also had no formal leadership role, but they could see that things needed to be improved and were enthusiastic to carry out change and so did so.

Figure 4: Extract of a display showing how children were working scientifically



The status of science in the school increased in 92% of cases, with 38% of teachers saying that there was 'much more' progress in this field. Similarly, 92% felt there had been an improvement in other teachers' science teaching with 17% judging this to be much more. There was universal agreement that next year the impact on other teachers and the status of science in the school would be much higher, as this year had been about developing their own confidence in teaching science and developing their leadership skills. They were now confident to implement more changes with a clear vision of where they wanted to get to and how they would get there. The support of senior leaders was a crucial factor in how much impact the teachers had beyond their own classroom.

Outcome – Use of better science-specific resources

Participants audited current science resources in their schools in order to identify whether there were enough to teach all aspects and topics in the new national curriculum. Participants in 4 out of every 5 schools considered that there were not enough resources to teach the curriculum. Much time was spent organising science resource cupboards, which had in many cases been neglected.

The project provided a range of resources, which significantly aided participants' progress. One said,

> *Our cupboard is now fully resourced and there is little in any catalogue that we are missing.*

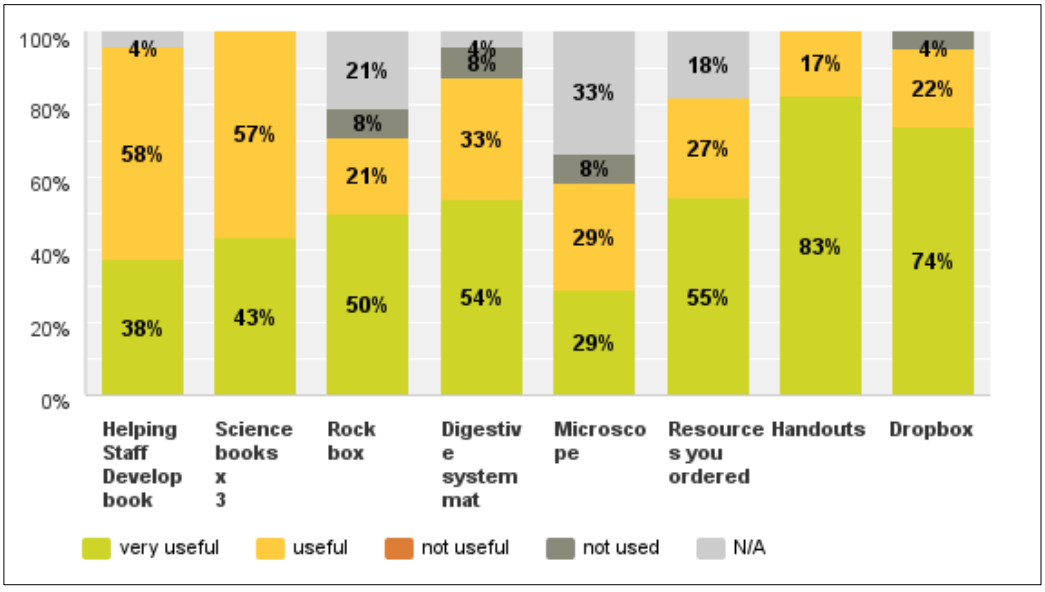
At the end of the project, the teachers evaluated the resources that the project provided (see Figure 5). The handouts from the 11 face-to-face sessions were most popular with 83% deeming them very useful. Dropbox held these and many other resources including links to websites, online resources, and videos, as well as photographs of displays, children's work and the use of the environment for science that were taken during the termly visits to

schools. Three-quarters of participants judged Dropbox to be very useful, with many people downloading the materials and distributing them to other teachers. There were, however, difficulties accessing Dropbox because of many schools' firewalls. A legacy of the project has been the setting up of a website to avoid this problem.

Each school was given three science books and one on leadership to support the participants' development and personal studies between sessions. The project also funded a large "digestion mat" that enabled children to walk through a large-scale representation of the digestive system; and, for those who needed them, a microscope and a box of rocks of geological interest, especially made up for the project.

Each school was given the opportunity to ask for up to £400 worth of science resources to support the participants in meeting their whole school targets about raising the status of science. This was very empowering for the teachers. Some ordered items that were essential to covering the curriculum; while others ordered items to enrich their provision. Participants in three schools, for instance, set up science trails to encourage more use of their outdoor areas, and so bought items such as thermometers to measure the air, water and soil in different parts of the grounds.

Figure 5: Participants' views of the usefulness of resources (July 2015, n=24)



8.2 Pupil Outcomes

Date pupil intervention started:

Table 11 – Pupil Outcomes for pupils benefitting from the project

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection

Higher Pupil progress and attainment	Questionnaire to participants- attainment and progress in Science Peer evaluation of pupils' work - 3 pupils per participant		1-4 scale (1 much more, 2 more, 3 same, 4 not sure)	September 2014	June 2015
Greater Pupil confidence	Teachers' views about pupil enjoyment Peer evaluation of pupils' work - 3 pupils per participant,	Sep 14 How much do your pupils enjoy Science lessons? July 15 How much <u>more</u> do your pupils enjoy Science lessons?	1-7 scale (7 high) in Sept 1-4 scale (1 high) in July	September 2014 Mean 5.44	July 2015 Mean 1.45

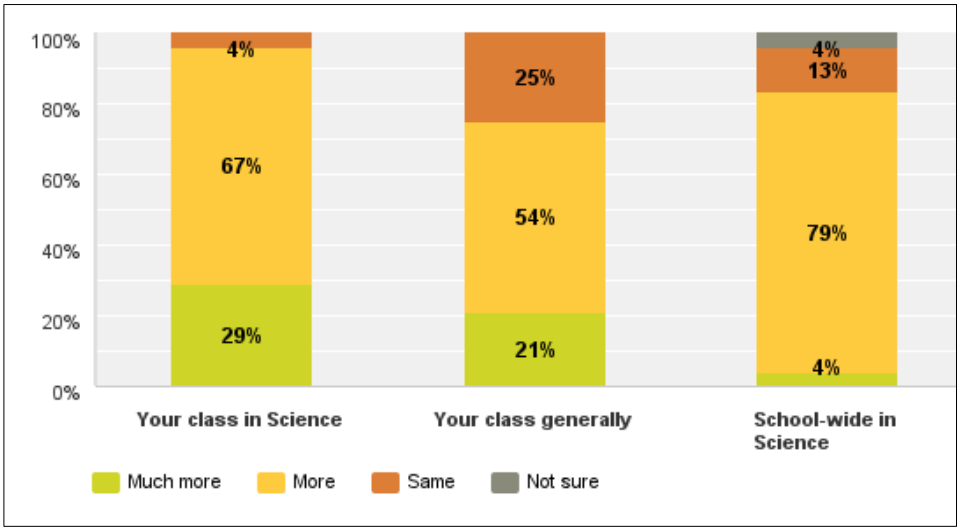
8.2.1

The impact on pupils was clear, according to the teachers, although the current context of "life without levels" has made this hard to quantify. The teachers were surveyed about the impact of progress by the children to whom they had taught science. All but one said that there had been more progress and 29% judged that there had been much more progress, as the figure below shows. The accuracy of these judgements was borne out by the work sampling that teachers did at the last session. There was much more science work in children's books than before, covering more topics, and being responded to with enthusiasm. The teachers noted: children had done far more investigations; recording was better; there was a greater range of ways of recording, such as tables, graphs, and drawings. Pupils were interviewed in focus groups, and they highlighted their greater enjoyment of science.

Here are some comments from teachers:

> *Pupil progress has come about through greater dialogue and discussion of their explorations.*
>
> *The children enjoy the challenges, cross curricular links, enquiry, links to real life and questioning.*

Figure 6: Teachers' views about pupils' progress as a result of the project (July 2015, n=24)



Some teachers also looked at pupils' books from the previous year, and the difference was striking. There was very little curriculum coverage in the previous year, and little evidence of investigative Science. This year the books were almost full and there was evidence of much greater curriculum coverage, investigations, and maths and literacy involved in Science. The presentation was of a much higher standard, showing greater pupil confidence and engagement.

8.3 Wider System Outcomes

Table 13 – Wider System Outcomes

Target Outcome	Research method/ data collection	Sample characteristics	Metric	1st Return and date of collection	2nd Return and date of collection
Science has a greater status in project schools	Online survey by teachers and science leaders. Separate online survey by head-teachers Audit of Science displays in classrooms	Surveys completed by all participating teachers		Number of and quality of Science displays in classrooms Oct 2014	Number of and quality of Science displays in classrooms June/July 2015
Improved leadership of Science	Online survey by teachers and science leaders. Online survey by head-teachers		Length of time as Science leader 1-7 for leadership development	Survey Sep 2014 – 28 teachers	Survey July 2015 – 24 teachers & 18 head-teachers

8.3.1

The schools were not chosen through any sampling method but simply from those who wanted to be involved. The project was offered initially to schools close to Coloma and then to the rest of Croydon, and then to contacts in neighbouring boroughs. The 24 schools were spread across six boroughs: 15 in Croydon, 3 in Bromley, 2 in Lambeth and Southwark, 1 in Merton and Lewisham. Most were primaries but four were junior and one was an infants' school.

The schools varied in their effectiveness, with one school being subject to special measures, three requiring improvement, five deemed outstanding, and the rest good in their last OFSTED inspection. Of the 24 schools, seven were faith schools: six Catholic and one Church of England. The demographics of their children varied too with the percentage eligible for free school meals ranging from three to 54 per cent. This range proved healthy because the teachers found that they were facing the same issues despite working in different contexts and it raised the bar for achievement when for instance a teacher in just her second year of teaching showed really high quality children's work from a school that was in extremely challenging circumstances.

The following data were collected:

- Participants completed an audit of Science displays in classrooms in October 2014 and June 2015.
- Questionnaire to Science leaders of 18 schools about pupil interest in Science completed June 2015.
- Self-report of usage of 'Helping Staff Develop in Schools' book during sessions and at final session in June 2015.
- Science leaders and all project participants evaluated their achievements in relation to their individualised targets.

Outcome: Improved leadership of Science

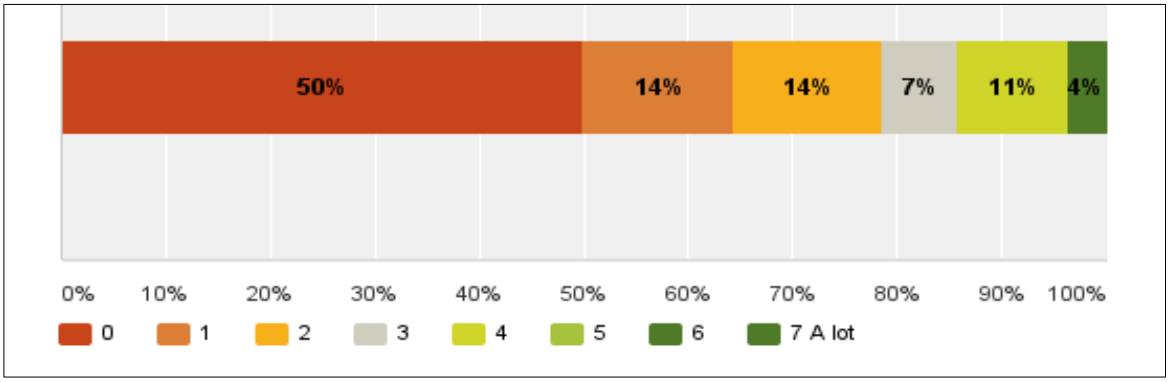
Most of the participants were new to leadership of science, and indeed most were new to any sort of subject leadership. Two-thirds of participants were brand-new to their role as science leader and only one person had over three years' experience. Half of the group had not had any leadership development, as the figure below shows. Some (14%) participants did not have a leadership role officially but developed one as a result of the project.

This state of affairs illustrates the status of science in primary schools at the moment. In the organisation of staffing structures, many schools do not have a teaching and learning responsibility payment for science, and this limits the amount that is achieved by anyone who decides to take the lead on improving science across their school.

The project thus had a significant impact in developing the teachers into leaders. This comment was typical:

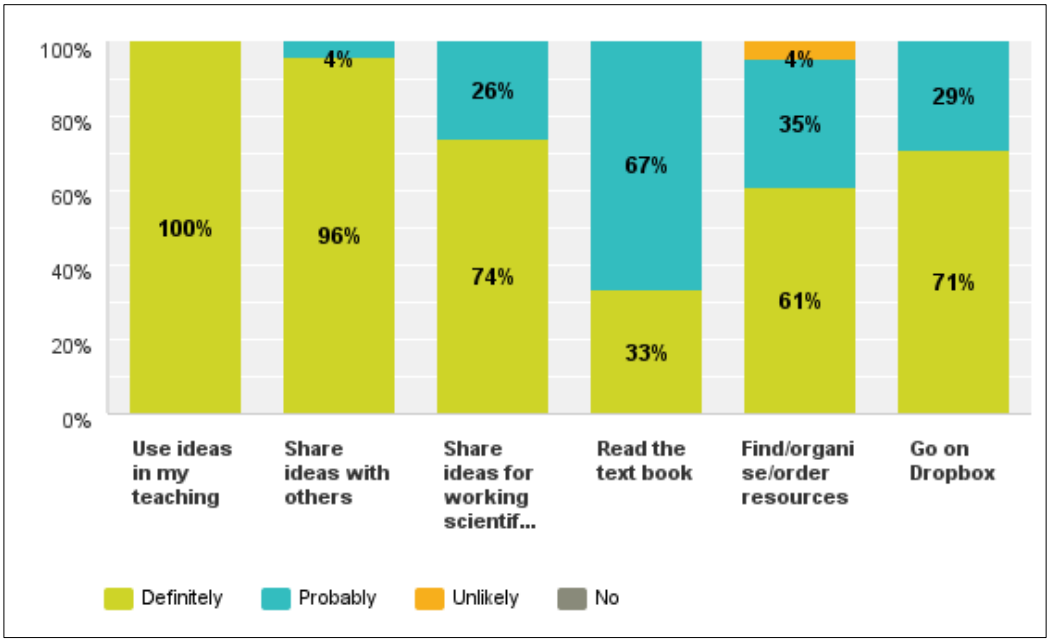
> *I've never had a leadership role before so the knowledge and skills I have learnt on the project have given me direction.*

Figure 7: How much leadership development participants had had before the project (n=27)



Leadership development was threaded through the training sessions and each session started with lunch and informal discussions about how action plans were going. Evaluation questions prompted action beyond as well as within each teacher's classroom as the figure below shows.

Figure 8: What participants said they would do following a session on Evolution and Inheritance (n=25)



The project leader and consultants made termly visits to the participants in their schools to help them implement change. These visits were a key to the project's success: all participants judged them good, and 80% rated them 'Great'. This form of coaching in the participants' own context levered up their impact on Science across the school. As one said, "The outside expert eye was vital to help us identify the road we need to travel". It helped Science leaders' action planning becomes more strategic.

The participants drove the agenda for the visits and so the consultants were involved in a range of activities, including supporting book scrutiny, skills audit, assessing pupils work, resources audit and designing a Science trail.

The successful leadership aspect of the project contributed to the promotion of several teachers. For instance, one teacher in her second year of teaching has been appointed science lead practitioner across a federation of six primary schools:

> *Being part of the Coloma science project has developed me personally, the children that I teach, the school in which I work and the federation. My own confidence has increased so much that I feel I can lead a team rather than simply being a part of it.*

Figure 9 shows the impact of the visits at different levels: giving direction was considered the greatest benefit.

Figure 9: Participants' views about the impact of the visits from a consultant (1=greatly, 2=some, 3=none, 4=not applicable)

How much did the visit ... –	Mean	Standard Deviation
Boost your confidence	1.45	0.59
Inspire you	1.45	0.50
Increase your Science knowledge	1.84	0.74
Develop teaching skills	1.70	0.78
Develop leadership skills	1.30	0.56
Give you direction	1.10	0.30
Increase your understanding	1.40	0.58
Help raise the status of Science	1.55	0.67
Help you in monitoring Science	1.50	0.74
Clarify the progress you've made	1.35	0.48
Enhance children's learning	1.75	0.54
Raise your status	1.65	0.73

Outcome: Science has a greater status in project schools

As a result of the project, Science had a greater status in all the schools. All headteachers judged the project to have raised the status of Science and a third considered that it was 'much more' (see Figure 10). One headteacher said, "Science has been re-energised in the school". Two schools achieved PSQM (Primary Science Quality Mark) – one at silver and another at gold – and others plan to apply for it as a result of completing the project.

Participants did an audit of displays throughout the school at the beginning and end of the project. In all schools, there was an improvement, with most classrooms having Science displays at the end. Displays show a more consistent use of vocabulary and higher profile of Science around the school.

Through book trawls, several participants identified repetition across different year groups. One found this in relation to plants so she developed a progression document which outlined exactly what aspect of the plants needed to be taught in each year group in order to ensure progression in children's learning.

Participants held staff meetings and training sessions and wrote or updated Science Policies. Some included having more open questions with opportunities for the children to use their scientific vocabulary. They outlined expectations of displays and the necessity to explore outside especially for units involving seasonal change. Some policies suggested that each year group should make a scientific visit at least once a year.

One headteacher said,

> *Science wasn't a priority at the beginning of the year but following our recent staff meeting, staff have demonstrated more enthusiasm for using the new resources and scheme.*

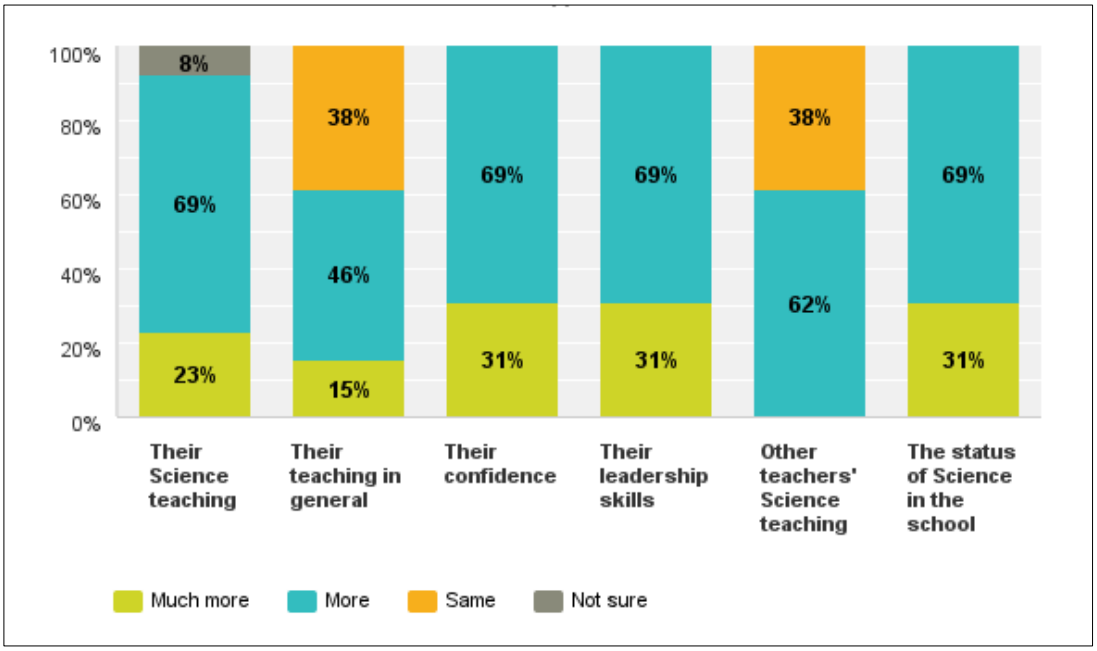
Many participants organised Science days, events or weeks for the whole school, including parents. These were very successful and inspired many comments, such as:

> *Children enjoyed Science Investigation Day with many across the school including it as part of their 'What I enjoyed most' section of their end of year evaluation sheets.*

> *It was an extremely practical day and was the basis of an entire corridor's display in the school.*

Participants organised science activities for parents and one school added a section in the parents handbook on children learning science at home. Another school has a section of the parents newsletter about science.

Figure 10: Headteachers' views on the impact of the project on participants' progress as a result of the project (n=14, commented on 19 participants)

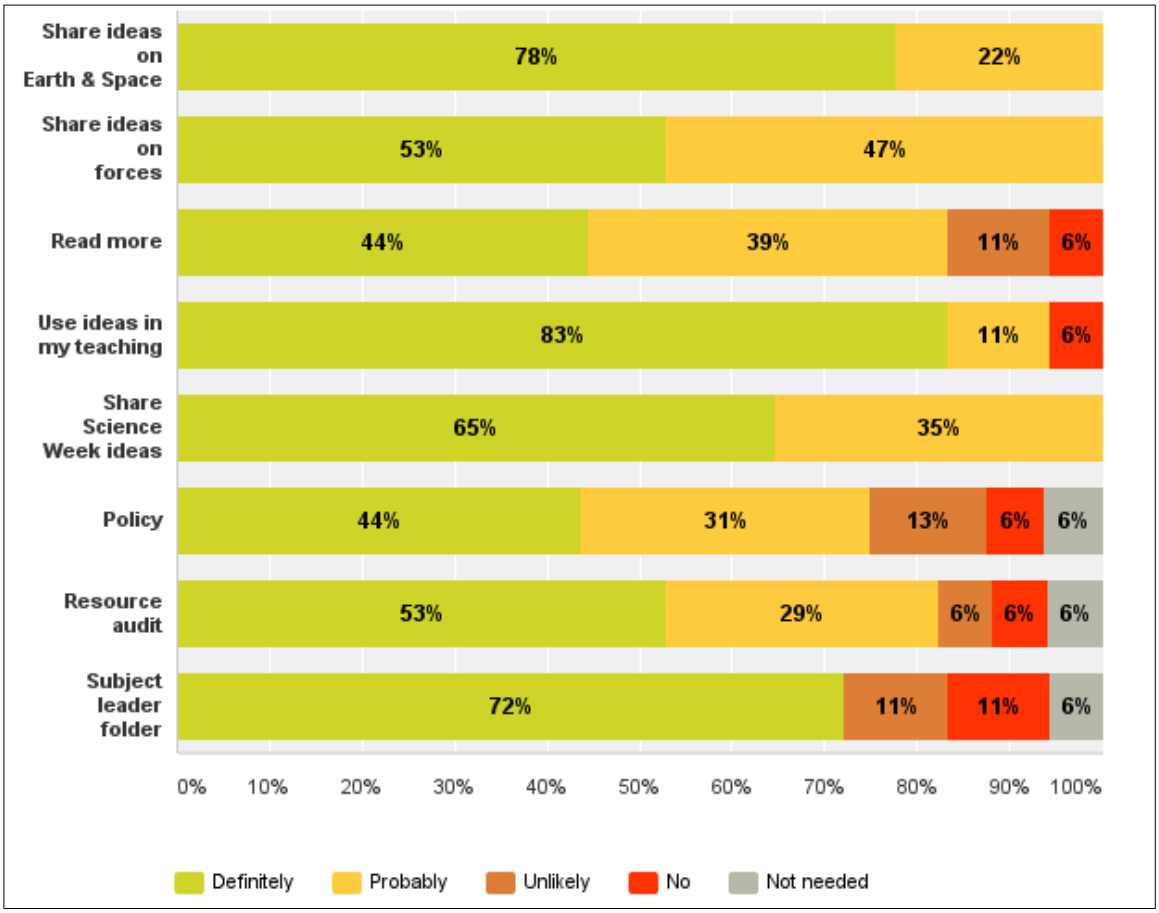


8.4 Impact Timelines

Impact was seen at different stages and to different degrees. During the sessions, which were highly interactive and involved conducting experiments, discussion and trying things out, it was clear that participants were highly engaged and enjoying their learning. The teachers were asked to complete an online survey which was sent that evening or the next day. This small time lag was deliberate in that it gave people the opportunity to reflect once the buzz from the fun they were having had abated.

The questions made suggestions that jogged participants into different levels of action: their own knowledge, practice, leadership and dissemination as the chart below shows. Many participants and their school leaders considered that impact on other staff and pupils would not be clearer until next year. Indeed, as one said, "I hope to see the main progress in the school next year when I do more training and staff meetings in science".

Figure 11: What participants planned to do after the Earth & Space session (March 2015)



9. Reflection on overall project impact

The overall impact of the Coloma Primary Science project was impressive. It fulfilled its aims to improve the subject knowledge and skills of primary teachers to enable them to teach the new Science curriculum and disseminate their learning to colleagues and raise the status of the subject in their schools.

The project involved 38 teachers from 26 primary schools across six local authorities in South London. The teachers ranged from NQTs to those close to retirement; from teachers of Nursery classes to Year 6. Their schools varied considerably too: from Outstanding to Special Measures, and from 3% of pupils eligible for free school meals to 54%.

Throughout the project there were constant threads: to deepen subject knowledge and understanding; gain ideas about how to teach topics to children, and dealing with common misconceptions; generate ideas about how to assess children's understanding, and to appreciate their progression. The 11 sessions in the second year had a mixture of activities and discussion, and enabled participants to model how their children might learn.

Participants' knowledge and understanding of science were tested at the start and end of the project: the average of their scores improved by 21%. The improvement in the teachers' confidence was striking: all said they were more confident as a result of the project and 52% said they were 'much more'. When the teachers were asked about the impact of the project, all said their pupils had made "more" or "much more" progress as a result of the project. They made huge strides in developing their leadership skills with 63% saying they had made 'much more' progress. Headteachers also rated the project highly, giving 100% positive scores for improvement in teachers' confidence, Science teaching and leadership.

As a result of the project, Science had a greater status in all the schools. All headteachers judged the project to have raised the status of Science and a third considered that it was 'much more' (see Figure 8). One headteacher said, "Science has been re-energised in the school".

The theory of change proved accurate. The role of the senior leaders within the school was, however, significant in either enabling or frustrating the impact of the project. The consultants' termly visits to each of the schools greatly enhanced the school-wide impact of the project by working with senior leaders to resolve any issues and motivate the participants. Peer learning was significant in raising the bar for all participants: they sparked ideas for implementation off each other. The time for this to happen formally and informally, face-to-face and virtually, was very important. The role of the project leader was vital in developing trust and providing both challenge and support.

Our findings support the hypothesis of the LSEF that investing in teaching, subject knowledge and subject-specific teaching methods and pedagogy will lead to improved outcomes for pupils in terms of attainment, subject participation and aspiration. Ongoing contact, leadership development and coaching are however vital in ensuring that input make a difference to outcomes and impact.

The preceding sections of this report fully illustrate the impact of the project – these should be read in conjunction with the Executive Summary in section 1 above and the report conclusions in section 12 below.

The project has contributed to the overall aims of LSEF in that it has:

I. Cultivated teaching excellence through investment in teaching and teachers so that attention is re-focused on knowledge-led teaching and curriculum.

II. Supported self-sustaining school-to-school and peer-led activity, plus the creation of new resources and support for teachers, to raise achievement in Science in primary schools

III. Supported the development of activity which has already been tested and has some evaluation (either internal or external), where further support is needed to develop the activity, take it to scale and undertake additional evaluation.

IV. created cultural change and raised expectations in the London schools involved.

<u>Meta-evaluation theme - stretch in primary schools</u>

Focus on stretch in primary schools is the meta-evaluation theme that is most relevant. Teachers in the project were challenged in terms of their science subject knowledge and stretched to teach the subject in new and interesting ways. Extra resources enabled the new national curriculum to be taught and inspired staff. As a result, children of all ages experienced a richer science curriculum and the improved quality of teaching resulted in challenge for the children. The progress in the participants' leadership development was hugely significant in spreading the impact of the project beyond their own classrooms.

10. Value for Money

10.1 Apportionment of the costs across the activity

Please provide an estimate of the percentage of project activity and budget that was allocated to each of the broad activity areas below. Please include the time and costs associated with planning and evaluating those activity areas in your estimates.

Broad type of activity	Estimated % project activity	£ Estimated cost, including in kind
Producing/Disseminating Materials/Resources	15	10,000
Teacher CPD (face to face/online etc)	70	55,000
Events/Networks for Teachers		
Teacher 1:1 support	20	15,000
Events/Networks for Pupils	n/a	0
Others as Required – Please detail in full		
TOTAL	100	£80,000

10.2 Commentary of value for money

The project delivered a great deal of value and the budget was spent wisely especially in the second year when there were 11 high quality training sessions for up to 28 teachers and termly visits to the participants in their schools, which incentivised and facilitated impact considerably.

The project was led by a consultant, Dr Sara Bubb. She and two other science consultants, Dr Andy Markwick and Gary Granger ran the training, and all three were involved in in-school support. The resources made a significant difference to teachers being able to improve their knowledge. Each school received four books and membership of the Association of Science Education (ASE), and in addition could request up to £400 for resources to address gaps in their school provision.

11. Reflection on project delivery

11.1 Key Enablers and Barriers to Achievement

Key Enablers

- consistent project leadership with a clear focus on helping teachers meet their goals
- the passion and enthusiasm of the consultants leading the training sessions
- assessing teachers' knowledge through a test as well as self-report and listing qualifications
- the mix of the group in the 2nd year of the project was a great enabler. There were between 3 and 6 from each primary year group which meant that people could easily work in trios. Participants came from schools across 6 different local authorities and this was also enriching.
- leadership development was threaded through the training sessions and this was vital to ensuring school-wide impact
- The visits to schools proved to be vital to the project success. They were an opportunity to help individuals within their own contexts. These were empowering to the participants because they set the agenda and headteachers were spoken with about the project. This resolved problems and accelerated progress, as this quotation from a teacher shows:
- The visits also gave an opportunity for the teachers' achievements to be praised in front of the headteacher and their colleagues. This raised their status and contributed to the promotion of several teachers. For instance, one teacher in her second year of teaching has been appointed head of science across the Federation of six primary schools.

What factors need to be in place in order to improve teacher subject knowledge?

- assessing teachers' knowledge through a test as well as self-report and listing qualifications

Barriers to Achievement

The support of senior leaders was a crucial factor in how much impact the teachers had beyond their own classroom. In a few cases senior leaders had an actively destructive role on the project. Two participants had to withdraw because their school leaders wanted them to focus their attention on English and mathematics and considered the project a distraction from their classroom practice. There were also cases where senior leaders stymied progress by not allowing the participants any staff meeting time to share their learning or resources from the project.

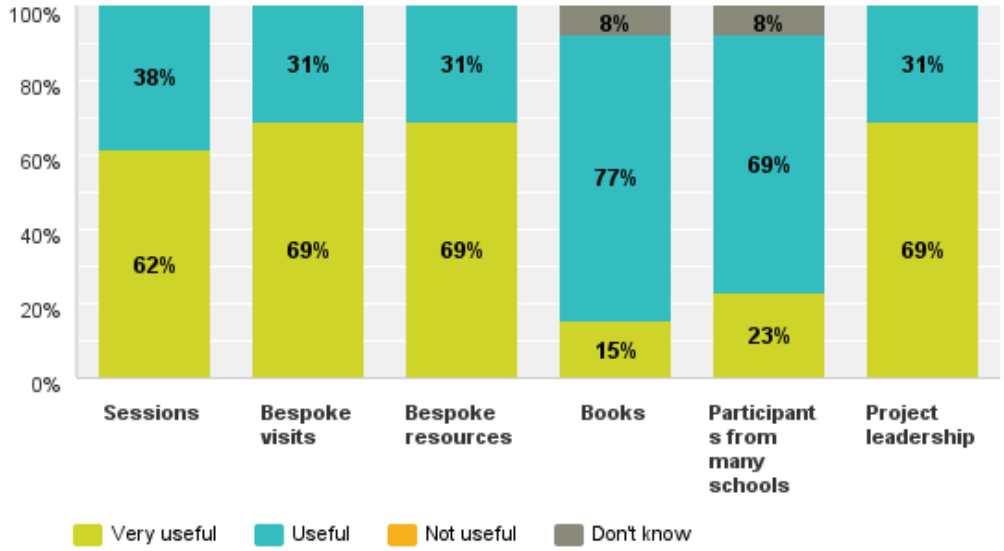
Although attendance was high, no session had 100% attendance due to teachers being ill; schools not allowing teachers to attend training because of disruption to children's education or not having cover for their classes; or having to leave early in order to attend meetings back at school.

11.2 Management and Delivery Processes

The management and delivery processes were very effective. The 11 sessions were spread throughout the year and were just 3 hours long on school afternoons which enabled teachers to be released from their schools on most occasions. The sessions held on Saturday mornings were very well attended and popular. The project was well managed in the 2nd year, with quick but useful evaluations being acted upon after sessions and all participants being kept in contact with.

Headteachers of the participants' schools were asked to give their views about the different elements of the project (see Figure 12). They valued all elements: the bespoke visits, the resources and the overall project leadership were what they valued most highly.

Figure 12: Headteachers' views about the value of different elements of the project (n=14, commented on 19 participants)



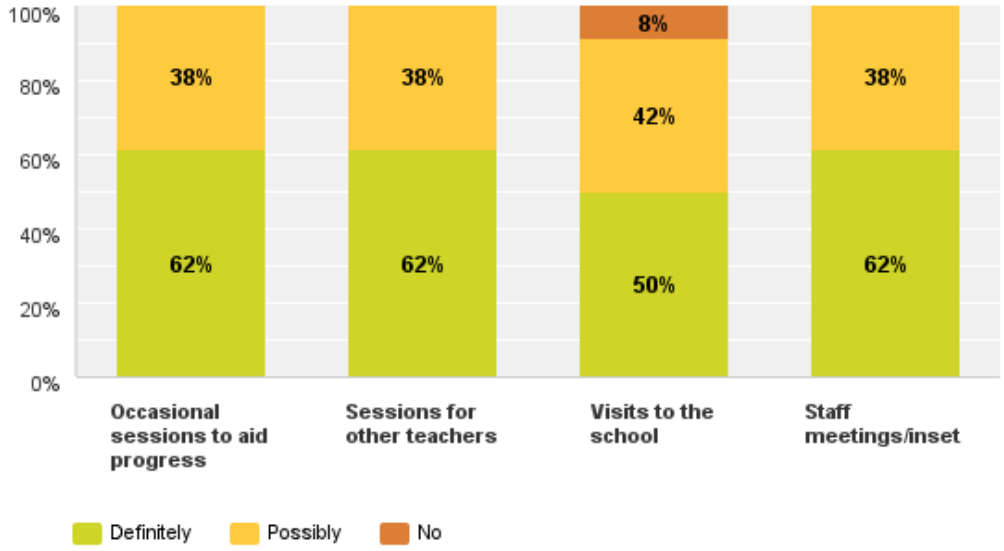
There were innovative delivery mechanisms. Some sessions were held on Saturday mornings. These were popular, had good attendance and resulted in better learning because teachers were fresher than in the school day afternoons. One session was held at the Horniman Museum where we designed a bespoke programme that enabled the teachers to see its potential for science trips but which also excited the teachers and contributed to their own learning. They enjoyed handling artefacts and getting inspiration from the exhibits, presentations by museum staff, input from the project consultants and discussions with each other.

The management and delivery mechanisms changed during the lifetime of the project. In the first year the project was managed by a teacher at Coloma but the administration and management took a great deal more time than expected. Dr Sara Bubb took over the leadership for the second year and her networks and project management experience resulted in much greater success.

11.3 Future Sustainability and Forward Planning

There are clear plans for the future sustainability of the project. As Figure 13 shows, the headteachers were keen for the project to continue with two-thirds saying that they definitely wanted occasional sessions to aid progress and sessions for other teachers and support with staff meetings and inset days, and half definitely wanting more consultants' visits to aid the current cohort's progress.

Figure 13: Headteachers' views about if and how the project should continue (n=14, commenting on 19 participants)



They felt that good progress had been made but that the impact of the project would not be seen until next year. They were also keen on this model being used in projects focusing on English, even if there were no funding (see Figure 14).

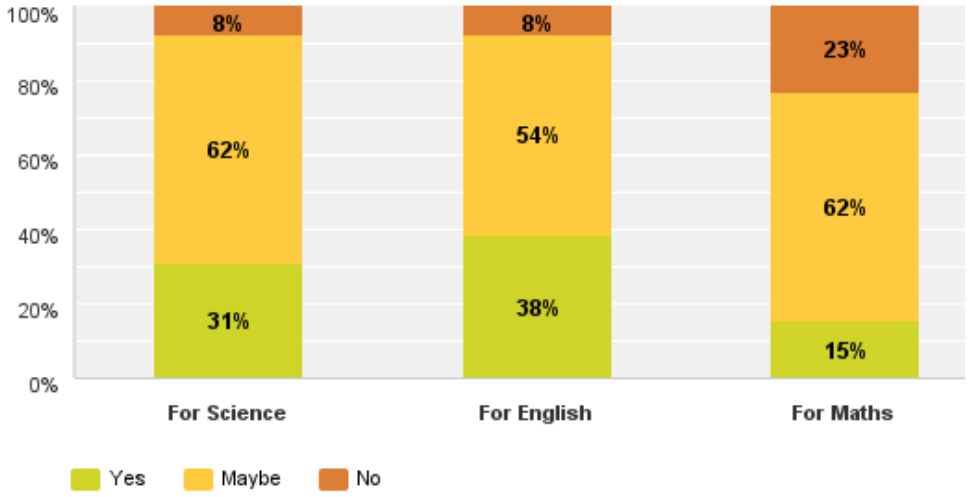
Coloma Convent School does not want to continue to be involved and so the new iteration will be called Excite Primary Science. We are organising a similar programme spread over 10 half days, and following on from the success of the visits to the Horniman Museum I have arranged for the Earth and Space session to be held at the Greenwich Royal Observatory and the evolution and inheritance session to be held in Darwin's house in Downe. We also plan to hold some top up sessions for those teachers that have already been part of the programme in order to help them sustain their progress.

The factors that are essential in the sustainability of the project are the willingness of schools to send teachers on the programme, funding their release time, paying for the programme and managing the disruption to children's education.

A website has been set up, called www.exciteprimaryscience.org and an improved programme will run in 2015-16. It is hoped that schools will apply for and win Enthuse Intensive awards from the National Science Centre in order to fund it.

We will share the project knowledge and resources through the website www.exciteprimaryscience.org and also through articles on *Londoned* in publications such as *Professional Development Today* and the *Times Educational Supplement*.

Figure 14: Headteachers' views about being involved in a similar project unfunded (n=14, commenting on 19 participants)



12. Final Report Conclusion

The Coloma Primary Science project was a great success. It fulfilled its aims to improve the subject knowledge and skills of primary teachers to enable them to teach the new Science curriculum and disseminate their learning to colleagues and raise the status of the subject in their schools.

The project involved 38 teachers from 216 primary schools across six local authorities in South London. The teachers ranged from NQTs to those close to retirement; from teachers with Reception classes to Year 6. Their schools varied considerably too: from Outstanding to Special Measures, and from 3% of pupils eligible for free school meals to 54%.

Throughout the project there were constant threads: to deepen subject knowledge and understanding; gain ideas about how to teach topics to children, and dealing with common misconceptions; generate ideas about how to assess children's understanding, and to appreciate their progression. The 11 sessions had a mixture of activities and discussion, and enabled participants to model how their children might learn.

The improvement in the teachers' confidence was striking: all said they were more confident as a result of the project and 52% said they were 'much more'. Participants' knowledge and understanding of science were tested at the start and end of the project: the average of their scores improved by 21%. When the teachers were asked about the impact of the project, all said their pupils had made "more" or "much more" progress as a result of the project. They made huge strides in developing their leadership skills with 63% saying they had made 'much more' progress. Headteachers also rated the project highly, giving 100% positive scores for progress in teachers' confidence, Science teaching and leadership.

Although both the participants and the headteachers considered that there the project had made an impact on pupil progress, achievement and attitudes, it is hard to be completely sure of the impact on pupils because the assessment of the subject is very complex. Where schools attempt it, it is often done superficially on knowledge measured in a scheme's multiple-choice test at the end of the unit. The project covered schools across six local authorities and there was very little similarity or consistency in assessment processes.

Key lessons learnt for assessment of project delivery

What activities/approaches worked well?

- The size and diversity of the group (28 participants across 21 schools in 2014-15) was good for ensuring different groupings and yet was still manageable.
- The visits to the schools made a crucial difference to the project impact. Although expensive, this form of coaching in the participants own context levered up participants' activities that made an impact beyond their own classroom.
- The use of a small passionate team of consultants who were creative, dynamic and supportive.
- One session was held at the Horniman Museum where we designed a bespoke programme that enabled the teachers to see its potential for science trips but which also excited the teachers and contributed to their own learning.

What difficulties were encountered in delivery and how could they be mitigated in the future?

There was no session with 100% attendance. Saturday morning sessions had the best attendance but those held on school day afternoons were affected by schools having difficulty covering participants classes and participants being required to return to school for meetings.

Were there any additional or unintended benefits (e.g. increases in student attendance as a result of an intervention aimed at teachers)?

- Other members of staff from participants' schools asked to attend particular sessions.
- Several participants were promoted as a result of the good work begun on the project. This has proved an Achilles heel however because they have been promoted to what are seen as higher status subjects such as English and mathematics.
- Two schools gained the Primary Science Quality Mark, one at gold and one at silver, and several schools have decided to apply for it next year.

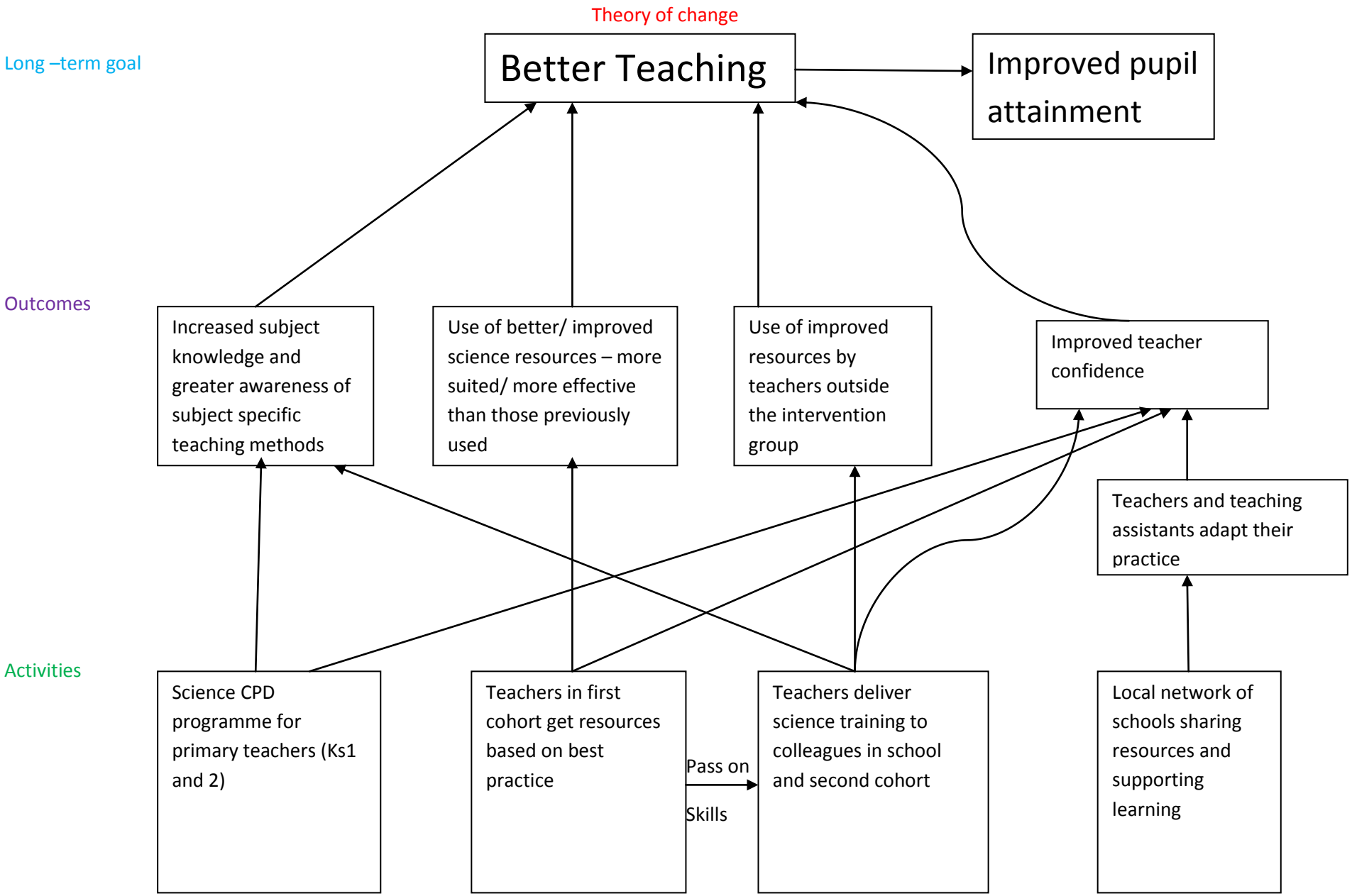
What should the project have done more of?

- Invest time in strategic project management
- Perhaps setting up a memorandum of agreement with schools would have helped to hold them accountable for releasing teachers to participate in face-to-face sessions and when visited by a consultant. However, we did not find recruitment easy and so this might have put off schools.

What recommendations would you have for other projects regarding scaling up and/ or replicating your project?

- The size of the group of 28 participants across 21 schools was sufficient for ensuring different groupings and yet was still manageable.
- Give structured time for participants to talk with each other
- The visits to the schools made a crucial difference to the project impact.
- The use of a small passionate team of consultants who were creative, dynamic and supportive made a considerable difference to teachers, especially those most lacking in confidence.
- The project thus had a significant impact in developing the teachers into leaders. This comment was typical:
- *I've never had a leadership role before so the knowledge and skills I have learnt on the project have given me direction.*

Appendix 1


Theory of change
Long –term goal
Better Teaching
Improved pupil attainment
Outcomes
Increased subject knowledge and greater awareness of subject specific teaching methods
Use of better/ improved science resources – more suited/ more effective than those previously used
Use of improved resources by teachers outside the intervention group
Improved teacher confidence
Teachers and teaching assistants adapt their practice
Activities
Science CPD programme for primary teachers (Ks1 and 2)
Teachers in first cohort get resources based on best practice
Pass on
Skills
Teachers deliver science training to colleagues in school and second cohort
Local network of schools sharing resources and supporting learning

Appendix 2

	Outputs	**Indicators of Outputs**	**Baseline data collection**	**Impact data collection**
Teacher outcomes **Sub Groups** As part of establishing the baseline, the characteristics of the eligible cohort should be analysed across the following sub groups: ☐ NQTs ☐ 3 years + ☐ Primary/ secondary ☐ Other (project specific) These will be expressed as a % of the whole group. **Churn** Throughout the programme thorough records of any "churn" of teachers leaving or joining the intervention group will be kept. Records will be kept of: ☐ Unique teacher identifier ☐ Engagement date ☐ Disengagement date and reason	☐ Increased subject knowledge and greater awareness of the new primary science curriculum	☐ Increased teacher scores in subject knowledge tests using KS3 Science test Tests to be taken by all teachers involved in the intervention	☐ Scores collected for individual teachers from pre intervention science knowledge/ teaching method tests of 24 teachers from 18 schools in 6 LAs on 7 October 2014	☐ Scores collected for individual teachers from science knowledge/ teaching method tests after Yr1 and Yr2 of intervention on 27 June 2015
	☐ Increased teacher confidence	☐ Increased teacher scores in confidence surveys using self-evaluation on surveymonkey self –developed questionnaire	☐ Scores collected for individual teachers from pre intervention confidence surveys on 12 October 2014	☐ Scores collected for individual teachers from post intervention confidence surveys after Yr1 and Yr2 of intervention on 27 June 2015
	☐ Delivery of higher quality teaching including subject-focused and teaching methods	☐ Improved teaching performance by self report ☐ Improved teaching performance in a 20% sample of observed lessons by Sara Bubb and Gary Granger using Ofsted Science teaching measures.	☐ Year 2 Questionnaire – self report 12 October 2014 ☐ Year 2 Observation of 20% of participants in Autumn term – November	☐ Year 2 Questionnaire – self report ☐ Observation of the same 20% of teachers in Summer term – May and June 2015

	☐ Use of better science-specific resources	☐ Use of science specific resources eg books, handouts and the items that each school buys to aid the project's aims	☐ List of new science specific resources by January 2015 ☐	☐ Questionnaire and discussion about how new resources have been used by 25 June 2015
Pupil outcomes **Churn** Throughout the programme thorough records of any "churn" of pupils leaving or joining the intervention group must be kept. In order to do this records must be kept of: ☐ Unique pupil identifier ☐ Engagement date ☐ Disengagement date and reason	☐ Increased educational attainment and progress in Science ☐ Increased pupil interest in Science	☐ Increased progress and attainment at KS1-2	☐ Questionnaire to participants about pupil enjoyment, attainment and progress in Science 12 October	☐ Questionnaire to participants about pupil enjoyment, attainment and progress in Science ☐ Work sampling of 3 pupils per participant where people peer evaluate 12 June 2015

School system outcomes	☐ Science has a greater status in project schools ☐ Improved leadership of Science	☐ More Science displays in classrooms ☐ Increased use of Science resources by staff in project schools ☐ Using 'Helping Staff develop in Schools' book ☐ Science leaders' action planning becomes more strategic	☐ Participants complete an audit of Science displays in classrooms November 2014 ☐ Questionnaire to Science leaders of 18 schools about pupil interest in Science 12 October ☐ Self-report of usage of 'Helping Staff develop in Schools' book during sessions ☐ Science leaders and all project participants set individualised targets with a baseline picture – November 2014	☐ Participants complete an audit of Science displays in classrooms June 2015 ☐ Questionnaire to Science leaders of 18 schools about pupil interest in Science June 2015 ☐ Self-report of usage of 'Helping Staff develop in Schools' book during sessions and at final session in June 2015 ☐ Science leaders and all project participants evaluate their achievements in relation to their individualised targets – June 2015