London Schools Excellence Fund

Self-Evaluation Toolkit

Final report

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Evaluation Final Report Template

Introduction

The London Schools Excellence Fund (LSEF) is based on the hypothesis 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. The GLA is supporting London schools to continue to be the best in the country, with the best teachers and securing the best results for young Londoners. The evaluation will gather information on the impact of the Fund on teachers, students and the wider system.

This report is designed for you to demonstrate the impact of your project on teachers, pupils and the wider school system and reflect on lessons learnt. It allows you to highlight the strengths and weaknesses of your project methodology and could be used to secure future funding to sustain the project from other sources. All final reports will feed into the programme wide meta-evaluation of the LSEF being undertaken by SQW. Please read in conjunction with Project Oracle's **'Guidance to completing the Evaluation Final Report'**.

Project Oracle: Level 2
Report Submission Deadline: Round 1 and Round 2 - 30 September 2015
Report Submission: Final Report to the GLA / Rocket Science *(delete as appropriate)*
Project Name: Programming for Teachers (including project extension)
Lead Delivery Organisation: St John's Baptist CoE School, Lewisham
London Schools Excellence Fund Reference: LSEF096
Author of the Self-Evaluation: John Jessel
Total LSEF grant funding for project: £52,030 (+ £12,910 for project extension)
Total Lifetime cost of the project (inc. match funding): £52,030 (+ £12,910 for project extension)
Actual Project Start Date: Oct 2013 (April 2015 for project extension)
Actual Project End Date: December 2014 (July 2015 for project extension)

1. Executive Summary

This report describes the main aims, components and outcomes of a project designed to increase computer programming knowledge of Key Stage 1 to Key Stage 3 teachers and their confidence and ability to deliver the Computing Curriculum to their pupils. This was a small-scale project that involved one class from each year-group from two single-form entry primary schools and two Year 7 classes from two secondary schools in the London Borough of Lewisham. A training programme was designed with teaching materials produced with units of work for pupils spanning Years 1 to 7. The planned programme comprised two days of face-to-face training of the teachers who then deliver the programme over two days with in-class support from the trainers. Written and practical tests to gauge knowledge and understanding were devised for teachers and for pupils, administered at the beginning and end of the training and teaching interventions, and the results used as part of the evaluation. Scale items for self-reporting of teacher confidence and self efficacy were similarly administered and the scores from these used along with qualitative data obtained through interview and observation as part of the evaluation process. As this was a small-scale project with a limited budget for intervention and evaluation, no comparison group was used. This report provides detail on the intervention and analysis of the evaluation data. Data available for the schools, the pupils involved and project costs and funding have also been summarised.

The main findings suggest that teachers were able to benefit from training sessions that took place over a relative short time period and accomplishments in programming were apparent, as were gains in confidence and self efficacy. Although teachers showed an increase in subject specific knowledge and greater awareness of subject-specific teaching methods for computing, it was also evident that continued support and modelling was needed for the teachers in delivering and assessing computing learning units with pupils. While teachers' theoretical accomplishments in subject knowledge and understanding can be achieved relatively quickly, progress in effective classroom delivery was found to be slower. The findings also suggested benefits occurred for pupils' knowledge and understanding and these were further explored through an extension to the Project which is also described in the report.

Departures from what was anticipated within the Project related both to the nature of the outcomes and the way in which they were achieved. Year 7 teachers within the time-frame available could not meet the demands necessary for programming at a level needed for their year-groups and it was also found that pupils' baseline familiarity with programming and readiness to progress was below that expected. As a consequence, modifications in both the training content for the teachers and what was taught to the pupils were made. In particular, the demands in knowledge and understanding necessary for work with computer languages such as Python which were regarded as more text-based in comparison to languages such as Scratch that were regarded as 'visually oriented' and more accessible.

Aims relating to the wider school and system outcomes, dissemination and sustainability of the Project are detailed within the report. These include a half-day school review that was well-attended with positive feedback from participants, as were a borough-wide conference and two-day workshop on programming for teachers. Teaching and training materials appropriate to each year group that can be used in teaching the National Curriculum Computing Programmes of Study from Key Stages 1 to 3 were produced as scheduled and made available online and have been used by schools within the Borough of Lewisham as well as across London.

2. Project Description

This project was delivered in response to the teaching demands made by the new National Curriculum Computing Programmes of Study (DfE, September 2013). It focused on an evident need by teachers for the development of relevant knowledge, understandings and pedagogical skills related to the Curriculum. In particular, the circumstances of its introduction could be seen as a vacuum in terms of guidance and assessment, with levels having been withdrawn and no existing historical assessment data. The project was relatively small-scale in that it directly involved four participating schools (two single-form entry primary, and two secondary, four-form and five form entry) that were linked with each recognising that they would benefit from support in order for teachers to be able to deliver a coherent computing curriculum in line with the new programmes of study.

The aim of the Project was to offer training to increase Key Stage 1 to Key Stage 3 teachers' computer programming knowledge, skills and confidence to deliver the Computing Curriculum. Through this the Project would also support teachers working with classes and in turn aim to increase pupil achievement in computing. A further aim was that teachers would be supported to develop activities that are fun and foster pupil creativity, reasoning and problem solving. The project would also facilitate collaboration between Key Stage 1, Key Stage 2 and Key Stage 3 teachers to ensure learner progression. The sustainability of the project would be addressed through a half-day workshop for the schools involved, and dissemination of the Project, its outcomes and the materials produced would take place through a borough-wide conference for teachers.

The aims would be achieved by delivering targeted computer programming training for teachers in individual year groups, ensuring planned progression of subject knowledge, concepts and skills at the appropriate levels for Years 1-7.

The training programme would comprise:

Stage 1: Production of tailor made resources for each unit of work.

Stage 2: Two days of face to face training of teachers. This would include trainers modelling how the unit can be taught and the teachers having the opportunity to experience learning from the pupil's perspective.

Stage 3: Delivery of unit by teacher over two days with in-class support from trainer.

Stage 4: A one-day face to face workshop with teachers to review and modify the unit and explore ideas for cross-curricular application.

The aim to support collaboration between the Key Stage 2 to 3 teachers was also to be achieved through project group meetings and the delivery of a transition activity in the third (summer) term by Year 7 teacher/s to Year 6 classes.

The Project was delivered initially in three LA-maintained schools in the London Borough of Lewisham and later revised to four so that another secondary school in the Borough could be included. Two of the schools covered the primary phase of education and two covered the secondary.

The Project was delivered by two consultants who had both worked in Lewisham schools. Both had extensive experience supporting schools to embed ICT into the curriculum: Zali Collymore-Hussein had 25 years experience as specialist ICT trainer gained through her role as secondary ICT co-ordinator/Head of ICT, teaching both ICT and Computer Science to 'A' Level. She was also manager of Lewisham City Learning Centre and a learning resources adviser. Deniece Graham was an ICT Advance Skills Teacher (AST) who had 19 years education experience in the primary phase. Deniece held the post of Creative Tools Strand Leader with Lewisham Education's Action Zone, 'Creating Success'.

The target groups were primary teachers working with Years 1 to 6 inclusive, and secondary teachers for Year 7. The intended training and teaching activities would begin with the introduction and use of concepts associated with programming and computer science (e.g., algorithm, abstraction, logical reasoning) which would be applied to specific tasks not necessitating the use of digital devices such as the computer (e.g., following a precise sequence of instructions to move from one part of the classroom to another). These ‘unplugged’ activities would lead towards a focus on developing sets of instructions expressed in a specific programming language so that they can be acted upon by the particular digital device to be used. In general, ‘computer’ could refer to any device that can accept an ‘input’ and produce an ‘output’ determined by a program of instructions which it is given and stores. For teachers participating in the Project working with very young children this would be a small robot that could move around the floor on wheels such as the ‘Roamer’, while for teaching older children including Key Stage 2 this would be the language ‘Scratch’ implemented on a more conventional form of computer. For teachers working with Key Stage 3 pupils the intention was to use the language ‘Python’ which the trainers understood was widely adopted within secondary schools and which they referred to as more ‘text-based’ regarding the instruction format in comparison to Scratch which they referred to as more ‘visually-oriented’ in this respect. Within their means, all of the above language implementations would allow the creation of relatively simple programs that could provide opportunities for ‘debugging’ if the output was not one that the programmer intended, and opportunities for the use of conditional statements (e.g., ‘if’, ‘then’, ‘else’) as skills in programming developed.

Project extension

The initial focus of the original project for Key Stage 1 was largely on the floor robot ‘Roamer’ and for Key Stage 2 the programming language ‘Scratch’. However, the capacity to include broader aspects of control technology was not addressed. In view of this an extension to the existing project that would explore the effectiveness of other approaches that would give scope for control technology to be included was approved. This would allow possibilities with newer forms of technology to be explored in ways that would support those elements of the Computing Curriculum relating to physical systems. Acting on the principle that programming and control technology are areas that cannot be isolated from other parts of the curriculum, a feature of this extension to the Project was that it would incorporate science and music as well as design and technology. This was because a lack of confidence expressed by some teachers in these particular areas led the trainers to believe that this could have indirectly acted as a barrier to fully engaging in a range of programming activities in the classroom.

If pupils were to focus on control then there would be a need for an understanding of basic electronics. In Year 4 onwards, the electronics would also provide links between science, design and technology and computing with some music. The extension thus included a new Year 4 unit to provide a more inclusive progression pathway into Year 5 and Year 6. This took advantage of the concept that sequence underlies both music and programming and this relationship could be built on in Year 5 in terms of creative activities linked with programming development. With Year 4 this would tie in and integrate computing with D&T, music as well as science and could fit better with a primary topic-related curriculum. This would also introduce electronics as a link between electricity and contemporary computer hardware and provide a foundation for understanding and coding control technology (e.g., initiatives such as a BBC micro bit given to every Year 7 pupil; Raspberry Pi, etc.).

A further point was that, with younger children, the teachers felt that, with devices such as Roamer, the commands were transient and did not remain visible for scrutiny and reflection and this had limitations. Indeed, one Year 3 teacher during an interview remarked 'Children found Roamer hard to use, just pushing buttons'. From such experiences it was thought it would be helpful to explore other tools for introducing computing. In response to this, one device that was selected was the floor robot Cubetto. Although still taking the form of a floor robot, this device could be controlled from an interface board with instruction blocks representing commands that could be arranged in sequence before being activated. Unlike Roamer's commands, Cubetto's remained visible so that children could analyse the instructions leading to the behaviour that they saw happening.

The Project extension was set up to support teachers from one of the primary schools participating in the original project. The groups involved were Reception and Year 1, and the cohorts of children from the original project who would now have moved on one year into Years 4 and 6. Training was planned for the Spring and Summer Terms and the format would have elements in common with the original project. This comprised half a day with the trainer working with the Reception and Year 1 teachers who worked together, followed by three half days working with 4 children from each of these year groups. For Years 4 and 6, the trainer worked individually with the teachers for one day which was then followed by three days equivalent of classroom support with the trainer and the teacher for the assigned year group working together. As noted in the evaluation framework (Appendix 1), the impact on teachers' knowledge and confidence for the Project extension was measured through tests and questionnaires together with qualitative material from observations and interviews. Similarly, the impact upon pupils' learning was measured through 'I can' statements and written work validated by the trainer. Some photographic and video records were also made of the children and their work with a view to these being an additional data source to be used in future material to be aimed at the academic and professional community.

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

If **Yes**, what does it address?

The Project addresses the computing programmes of study for Key Stage 1, Key stage 2 and the transition into Key Stage 3.

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.

The materials currently reside in a Dropbox account which Anna Spinks can access. A catalogue is attached detailing materials.

Year 1 resources can be found at: **http://resources.primotoys.com** (username and password to be given by e-mail as site is still under construction)

3. Theory of Change and Evaluation Methodology

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

The Theory of Change is attached and although designed with reference to the original project, is also regarded by the trainer for this part of the work to be applicable to the project extension.

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 Outcomes			
Teacher Outcome 1:	Greater knowledge of key programming concepts and ability to apply these in problem solving and creative activity, and the associated pedagogical knowledge of computer programming. Targeted Year 1-6 teachers have increased programming knowledge for visually-based languages at the appropriate NC level for their pupil age and greater awareness of subject-specific teaching methods. Targeted Year 7 teachers in addition have increased programming knowledge 0for text-based languages.	Targeted Year 1-6 teachers have increased programming knowledge at the appropriate NC level for their pupil age and awareness of subject-specific teaching methods.	Neither Year 7 teachers nor pupils had readiness to start programming in the text-based language Python. Therefore appropriate to follow Year 5 unit with some modifications.
Teacher Outcome 2:	Increased teacher confidence in teaching the programming element of the new Computing element of the National Curriculum and ability to support peers in delivering this.		No change
Teacher Outcome 3:	Teachers have access to quality training materials.		No change
Teacher Outcome 4:	Teachers have a clear understanding of the progression in skills in the computing curriculum and understand the learning journey their pupils will undertake.		No change

Teacher Outcome – Project Extension:	The extension is based on similar aims as the original project, that is, acquisition of teacher subject knowledge and pedagogical ability and confidence relating to exploratory programming activities. The new unit provides a better understanding of how a computer works. For Reception and Year 1, developing pedagogical strategies using newly developed commercial hardware resources. Development of materials and assessment framework. For Years 4 and 6, integration of computing into a topic approach within the school curriculum and the development of electronics and music activities linked to programming.		No change
Pupils Outcomes			
Pupil Outcome 1	Pupils make progress in meeting the appropriate NC criteria for the Programming and Algorithm strands of the new Computing Curriculum		No change
Pupil Outcome 2	Improved transition and progression from visual to text-based computer programming for pupils in transition from Y6 to Y7. (More complex skills introduced through coding activities to create games.)		No change
Pupil Outcome 3	Learning offers more opportunities for pupils to consider a greater range of career paths.		No change
Pupil Outcome –	Reception and Year 1:		No change

Project Extension	use of Cubetto Play Set so that pupils learn basic programming logic through a tactile learning interface. Year 4: Improved knowledge and skills related to Electricity and Circuits Unit (using Electro dough and Makey Makey). Year 6: Improved knowledge and skills related to Robotics and Coding Unit. (The children build and code Cubetto Robot.)		
Wider System Outcomes			
Wider System Outcome 1	Teachers outside the intervention group have access to exemplars of good practice and better resources aimed at increasing knowledge and understanding of the new National Curriculum requirements in Computing. This would take place through identified teachers providing model lessons for teachers from the borough to observe.	Identified teachers will disseminate what has worked well and lessons learnt in their Programming journey at Primary ICT Conference for Lewisham Schools. To share pedagogy and project resources via an open 2 day workshop for teachers from London Schools on how to teach computer programming concepts through unplugged activities and Scratch.	Identified teachers were at a relatively early stage in developing their own skills and it was considered not appropriate for them to provide model lessons at that time. The conference and the two-day workshop held later on in the project were instead used as a basis for models in the end.
Wider System Outcome 2	Partner schools will become 'Centres of Excellence' who promote computing and support other schools in developing and delivering a rigorous curriculum		No change
Enter additional Outcome Name add extra lines as			

necessary			

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

If **Yes**, what were these changes (e.g. took on additional activities?)

Neither Year 7 teachers nor Year 7 pupils showed readiness to start programming in the text-base language Python and it was found more appropriate for them to follow, with some modifications, the Year 5 unit based on the more visually oriented language Scratch .

The extent of Key Stage 2-3 collaboration was enhanced through exchange meetings that took place at lunchtimes between Year 6 and Year 7 teachers. Two Year 7 teachers attended a Year 6, 1-day transition activity relating to Python in Year 6 that was run by the Project trainer.

There was a repeat of Year 5 and Year 6 training carried out in the original project because the participating teachers in School 2 left their employment.

3.3 Did you change your curriculum subject/s focus or key stage? **No**

If **Yes**, please explain what changes you made, why, and provide some commentary on how they affected delivery**. n/a**

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

Yes, for the original project.

In the case of the project extension, because some of the hardware resources were still being developed, a number of technical and hardware constraints and interfacing problems with the laptops occurred that the suppliers were not able to resolve at the time. Additionally, the revised version of Cubetto robot was not available from the supplier and so work was carried out with the robot in its original form.

For Reception, Year 1 and Year 6 there were some modifications. A pilot was carried out with a small group of 4 children for Year 1 and 4 for Reception. Findings and activities from this were to be shared with other Reception and Year 1 teachers in September 2015 so they could deliver the relevant activities. Year 6 needed further development of the robotics elements of the activities. Half a unit was fully tested and revised and the other half only partially tested. Therefore the unit could not be graded as originally intended.

4. Evaluation Methodological Limitations

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

This is a small scale project limited by the number of teachers and pupils directly targeted for intervention. The main body of data relates to each year-group of two single-form entry primary schools and the two Year 7 groups from each of the two secondary schools. As the entire primary pupil and teacher population have been subject to the course intervention a pre-experimental design (as agreed on behalf of the funders within the remit of the Evaluation Standards Framework, Level 1) was only possible within the two primary schools involved and nothing further than this was attempted with the secondary schools. The above factors have a limiting effect in terms of the statistical robustness of any treatment effects that could be derived from the repeated quantitative measures taken and any inferences made from these. At best, therefore, the Project can only be discussed in terms of a possible contribution to outcomes rather than their cause.

The tests designed to measure changes in the programming knowledge, understanding and performance of both pupils and teachers, consisted of similar items administered pre- and post-intervention. Although the baseline knowledge and skill level was relatively low, and the nature of the questions on algorithmic thinking and programming detailed and specific, in some respects there are, of course, inherent threats in terms of validity arising from an increase in familiarity with the testing format. Similarly, particularly in the case of the pupils, attributing change to the Project could have been compromised by maturation and not attempting to isolate the impact of other factors. Additionally, the tests had to accommodate a potentially wide range of ability as well as taking into account possible floor and ceiling effects without using an excessive number of items (which would have been out of keeping with the scope of the Project). Although the range of difficulty was shown to be appropriately judged, the number of items addressing each area and level of knowledge or skill was therefore limited with consequent implications for reliability. The test items used for both the teachers and the pupils in different Key Stages, although having similarities, were different in detail and this could give rise to inconsistencies when making comparisons.

Disruptions within the school settings are not uncommon and for this project resulted in missing data due to teachers leaving and pupil absences for within-school data. With regard to the conferences and workshops, questionnaires were not returned or fully completed by all participants. In the latter case, biases could have occurred in the data in relation to those participants who were more diligent in completing returning their questionnaires. A further effect of school disruptions was the rescheduling of training and classroom sessions so that the interventions occurred over different lengths of time which could have compromised the progress anticipated. Moreover, although pre- and post-tests and questionnaires were administered on the first and last training sessions respectively, deviations from the scheduled pattern of interventions (which were considerable in some cases as evident from the dates reported in the evaluation framework) will have in turn compromised reliability.

Teacher confidence was based on self-report Likert scales designed for the project and the self efficacy was based on a Likert scale adapted from Megan Tschannen-Moran (Ohio State University) and supplied by LSEF organisers. The measures obtained from these may be more informative than binary responses but are, of course, subject to the validity problems commonly associated with self reporting such as either the tendency to respond towards the middle of the scale or, in other instances, under- or over-assessment.

The number of teachers participating in the Project was considered to be too small to be considered in terms of representing a wider population. However, in view of the data given in Section 7 and taking account of the exceptions noted, the participating children could be regarded as broadly representative of others within the Borough of Lewisham and many other parts of London.

In spite of the above limitations (all of which were anticipated) it was thought that the methods used for evaluation could nevertheless provide some indicative data that could be obtained within the limits of the resourcing available. Clear trends in the quantitative findings for both teachers and pupils across all year groups are discernible and when supplemented by questionnaire and interview data that were also gathered could provide a usable base for evaluation of the intervention.

With the project extension the Reception and Year 1 samples of pupils was too small for quantitative effects to be considered but qualitative indicators of the viability of the resources, teaching materials and methods used were obtained from detailed observations and video recordings.

4.2 Are you planning to continue with the project, once this round of funding finishes? Yes/No

Not insofar that the Project is funded for a specific time period and anything beyond this falls within the area of sustainability. However, funding possibilities are being explored with the London Diocesan Board for Schools (LDBS) SCITT to trial new materials.

If **yes**, will you (and how will you) evaluate impact going forward?

Only as far as resources allow, and this is unknown at the time of writing.

5. Project Costs and Funding

5.1 Please fill in Table 2 and Table 3 below:

Table 2 - Project Income

	Original[1] Budget	Additional Funding	Revised Budget [Original + any Additional Funding]	Actual Spend	Variance [Revised budget – Actual]
Total LSEF Funding	£52,030.00	£12,910.00	£64,940.00	£64,940.00	£1,000
Other Public Funding	0	0	0	0	0
Other Private Funding	0	0	0	0	0
In-kind support (e.g. by schools)	Hosting	Hosting	Hosting	Hosting	0
Total Project Funding	£52,030.00	£12,910.00	£64,940.00	£64,01.00	0

List details in-kind support below and estimate value.

Cost of venue (School 1) for 1 day (conference) = £500.00

Use of school computer room (School 3) for 2 days for Year 6 pupils, £500.00

School administration: Timetabling for School 1 for 2 days per term for Year 1; 4 days for Year 2 (autumn and summer), at £100.00 per day; Timetabling for School 2 = 4 days overall £15.00 per hour (with on costs) at £100.00 per day.

Trainer acting as coordinator = 20 days at £2,000.00

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

Evaluation: requirements changed so additional time contributed.

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)	£11,100.00	£0.00	£11,100.00	£11,100.00	£1,000.00
Direct delivery costs e.g. consultants/HE (specify)	£0.00	£0.00	£0.00	£0.00	£0.00
Management and Administration Costs	£4,000.00	£2,910.00	£6,910.00	£6,910.00	£0.00
Training Costs	£31,250.00	£8,000.00	£39,250.00	£39,250.00	£0.00
Participant Costs (e.g. Expenses for travelling to venues, etc.)	£2,180.00	£1,000.00	£3,180.00	£3,180.00	£0.00
Publicity and Marketing Costs	£0.00	£0.00	£0.00	£0.00	£0.00
Teacher Supply / Cover Costs	£0.00	£0.00	£0.00	£0.00	£0.00
Other Participant Costs	£0.00	£0.00	£0.00	£0.00	£0.00
Evaluation Costs	£3,500.00	£1,000.00	£4,500.00	£4,500.00	£0.00
Others as Required – Please detail in full	£0.00	£0.00	£0.00	£0.00	£0.00
Total Costs	£52,030.00	£12,910.00	£64,940.00	£63,940.00	£1,000.00

5.2 Please provide a commentary on Project Expenditure

The project spend profile closely matches the allocated budget to support three schools (two primary and one secondary) with the Key Stage 1-3 Computing Curriculum. However, staffing issues in the sole secondary school resulted in the withdrawal of support and funding which was then redirected to an alternative secondary school to ensure full implementation of the project. Funding was also diverted from an under-spend arising because a half-day transition activity in the third (Summer) term by Year 7 teacher/s to Year 6 classes did not take place. As a result additional support was provided for Year 5 and 6 classes in both primary schools.

Project extension:
Additional funding was gained to develop two units of work to deliver computing through a topic approach focusing on electricity, circuits, computing hardware and programming. A third unit explored new technology for the introduction of programming at Key Stage 1. The project spend profile matched the allocated budget.

6. Project Outputs

Please use the following table to report against agreed output indicators, these should be the same outputs that were agreed in schedule 3 of your Funding Agreement and those that were outlined in your evaluation framework.

Table 4 – Outputs

Description	**Original Target Outputs**	**Revised Target Outputs** *[Original + any Additional Funding/GLA agreed reduction]*	**Actual Outputs**	**Variance** **[Revised Target - Actual]**
Initial Project				
No. of schools	3	4	4	+1
No. of teachers	14	16 (+1) = 17	16 (+1) = 17	2 (+1) = +3
No. of pupils	420	525 (+8) = 533	525 (+8) = 533	105 (+8) = 113
Conference attendees	1 day: 30 teachers primary conf. Lewisham		1 day: 24 teachers primary conf. Lewisham	0 days - 6 teachers
3 London-wide CPD days consisting of a 2-day workshop for KS 2/3 teachers and a 1-day workshop KS 1 (planned)	3 CPD days, 50 teachers in total	2 CPD days comprising a workshop for KS 2/3 teachers	2 CPD days delivered at Goldsmiths with attendance of 29 teachers	-1 day - 21 teachers
Yr 6 to year 7 transition activity	4 teachers	4 teachers	4 teachers	0
Tailor made resources, lesson plans and assessment framework available in each school.	Resources for 7 units Years 1-7	Year 5/6 resources and activities adapted for Year 7. Additional unit for Year 6 and replacement unit for Year 4. Compiled Year 7 activities to introduce programming with Python (adapted from transition day)	8 units of work	+1 unit of work
Sustainability plan for each school	3 schools	4 schools	4 schools	+1 school

Collaborative network established between schools.	3 schools	2 schools (primary only)	4 (strong collaboration between 2 primary schools and collaboration between two secondary schools)	+1 school
14 digital leaders created in 3 schools (typo error in application document: 18 should be 14)	14	16 (includes 2 additional secondary teachers)	16 achieved (but 1 did not complete because of maternity leave and did not teach her group)	+2 digital leaders
Training completed for 14 teachers	14	16 (includes 2 additional secondary teachers)	16	+2 teachers
Lessons delivered to 14 classes	14	18	18 classes delivered and (but 1 class 50% delivered because School 3 withdrew)	+4 classes
Project extension				
No. of schools	1	1	1	0
No. of teachers	4	4	4	0
No. of pupils	68	68	68	0
Production of teaching and learning resources, lesson plans and assessment ladder.	Resources and assessment ladder for Reception, Years 1, 4 and 6.	Resources and assessment ladder for Reception, Years 1, 4 and 6.	Resources and assessment ladder for Reception, Years 1, 4 and 6.	No change
Training completed for 4 teachers	4 teachers	4 teachers	4 teachers	No change
Lessons delivered to 4	4 Reception and 4 Year 1	4 Reception and 4 Year 1 pupils	4 Reception and 4 Year 1	No change

Reception and 4 Year 1 pupils and 1 Year 4 and 1 Year 6 class.	pupils and 1 Year 4 and 1 Year 6 class.	and 1 Year 4 and 1 Year 6 class.	pupils and 1 Year 4 and 1 Year 6 class.	
Video to capture teacher and pupil learning experience				
Enter additional output name add extra lines as necessary				

7. Key Beneficiary Data

Please use this section to provide a breakdown of teacher and pupil sub-groups involved in your project.

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

Benefitting teachers are those trained directly by the consultants as part of the Project intervention.

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 (Data obtained Autumn 2013)						
School 1	*6*	*0*	*50*	*50*	*100*	*n/a*
School 2	*6*	*0*	*14*	*86*	*100*	*n/a*
School 3	*2*	*50 (1 not Q)*	*0*	*50*	*n/a*	*100*
School 4	*2*	*50 (1 not Q)*	*0*	*50*	*n/a*	*100*
Project						

extension (Data obtained February 2015)						
School 1	4	0	0	100	100	n/a

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)*

Schools 1 and 2 (primary) are single-form entry and the two secondary schools, at four- (School 4) and five- (School 3) form entry, are relatively small for the Borough. The numbers relating to teacher sub-groups are too small to make reliable comparisons with wider school benchmarks.

7.2 Pupil Sub-Groups (these should be pupils who directly benefit from teachers trained)

Please provide your definition for number of benefitting pupils and when this data was collected below *(maximum 100 words)*

Benefitting pupils are those who have been taught directly as class groups by the benefitting teachers as part of the intervention process.

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

(Numbers in brackets in the table below refer to the whole school rather than the participating classes.)

	No. pupils	**% LAC**	**% FSM**	**% FSM last 6 yrs**	**% EAL**	**% SEN**
Project Total						
School 1	*180*	*1.9*	*14*	*20*	*47*	*9*
School 2	*180*	*0.4*	*23*	*36*	*90*	*17*
School 3	*52 (767)*	*0*	*21 (18.4)*	*36.6*	*11(16.8)*	*33 (5.1)*
School 4	*115(616)*	*2.0*	*15.7 (23.8)*	*39.1*	*8 (25.5)*	*10*
Borough 2014 Pri	*25,777*	*0.77 Pri & Sec*	*23.8*	*24.9*	*33*	*2.7 Pri & Sec*
Borough 2014 Sec	*14,085*	*0.77 Pri & Sec*	*22.3*	*24.8*	*27*	*2.7 Pri & Sec*
Inner London 2014	*257,965* *151,665*	*0.64 Pri & Sec*	*28.6 pri* *32.5 sec*	*32.6* *35.0*	*56* *50*	*2.8 Pri & Sec*
Outer London 2014	*466,215* *321,755*	*0.48 Pri & Sec*	*16.7 pri* *16.3 sec*	*18.7* *17.3*	*44* *35*	*2.7 Pri & Sec*

	No. Male pupils	**No. Female pupils**	**% Lower attaining**	**% Middle attaining**	**% Higher attaining**
Project Total					
School 1	*116*	*94*	*No data available*	*No data*	*No data*
School 2	*132*	*116*	*No data available*	*No data*	*No data*
School 3	*32 (459)*	*20 (308)*	*13*	*56*	*31*
School 4	*75 (353)*	*40 (263)*	*28*	*56*	*16*

	% Asian Indian	% Asian Pakistani	% Asian Bangladeshi	% Asian Any Other background	% Black Caribbean	% Black African	% Black Any Other Background	% Mixed White & Black Caribbean	% Mixed White & Black African	% Mixed White & Asian	% Mixed Any Other Background	% Chinese	% Any other ethnic group
Project Total													
School 1	*1*	*1.5*	*1*	*13.5*	*26*	*13*	*12*	*4*	*2*	*0*	*4*	*1.5*	*2*
School 2	*1*	*0*	*0.4*	*4*	*30*	*33*	*7*	*2*	*4*	*0*	*0.8*	*8*	*5*
School 3	*0*	*0*	*0*	*0*	*25*	*4*	*16*	*12*	*1*	*0*	*1*	*0*	*1*
School 4	*0.9*	*0.9*	*0.9*	*2.7*	*25.7*	*16.1*	*10.7*	*4.5*	*0*	*2.7*	*0.9*	*1.8*	*2.7*
Borough 2014 Pri	*1.3*	*0.9*	*0.7*	*4.1*	*15.2*	*16.3*	*7.6*	*5.6*	*2.3*	*1.4*	*4.7*	*1.4*	*2.6*
Borough 2014 Sec	*0.7*	*0.7*	*0.8*	*3.3*	*19.0*	*19.2*	*4.2*	*5.1*	*1.9*	*0.9*	*4.5*	*1.5*	*3.3*
Inner Lon 2014 Pri	*2.4*	*3.1*	*11.8*	*2.6*	*7.9*	*17.6*	*3.7*	*3.2*	*1.4*	*1.2*	*4.8*	*0.8*	*6.6*
Innr Lon 2014 Sec	*2.4*	*3.2*	*12.6*	*2.4*	*8.9*	*17.8*	*2.9*	*3.1*	*1.4*	*0.9*	*4.1*	*0.7*	*7.5*
Outr Lon 2014 Pri	*7.0*	*5.2*	*2.0*	*5.9*	*3.8*	*11.8*	*1.8*	*2.3*	*1.3*	*1.9*	*3.7*	*0.7*	*4.9*
Outr Lon 2014 Sec	*7.5*	*4.9*	*2.0*	*5.6*	*4.5*	*10.9*	*1.8*	*2.1*	*1.0*	*1.5*	*3.2*	*0.7*	*4.6*

	% White British	% White Irish	% White Traveller of Irish heritage	% White Gypsy/Roma	% White Any Other Background
Project Total					
School 1	*16*	*0*	*0*	*0*	*2.5*
School 2	*3*	*0*	*0*	*0*	*2*
School 3	*40*	*0*	*0*	*0*	*0*
School 4	*22.3*	*0.9*	*0*	*0*	*6.3*
Borough 2014 Pri	*23.5*	*0.4*	*0.0*	*0.1*	*9.4*
Borough 2014 Sec	*21.7*	*0.6*	*0.0*	*0.1*	*8.2*
Innr Lon 2014 Pri	*17.8*	*0.6*	*0.1*	*0.1*	*13.1*
Innr Lon 2014 Sec	*17.5*	*0.8*	*0.1*	*0.1*	*11.7*
Outr Lon 2014 Pri	*33.5*	*0.7*	*0.1*	*0.2*	*12.3*
Outr Lon 2014 Sec	*36.9*	*0.8*	*0.1*	*0.1*	*9.6*

Borough average data were obtained from:
http://data.london.gov.uk/dataset/percentage-pupils-ethnic-group-borough

School data obtained from:
http://www.education.gov.uk/schools/performance/geo/la209_all.html

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)*

Firstly, it should be noted that as computer programming is regarded as a new subject there is no historical data relating to performance specifically on this. The comparisons below are therefore restricted to the more general statistics reported in Tables 6 to 8. Inspection of these tables suggests that, apart from the variations noted below, the targeted pupils were broadly representative of those attending other schools shown in the statistics for the Borough. More specifically, with regard to the percentage of looked-after children, as the cohort studies was relatively small, the slightly higher representations shown for Schools 1 and 4 fall within the range of what would expected from the presence of one or two children in Schools 1 and 4. Similarly, as very small samples were involved, the percentage of free school meals was in keeping both with the Borough and Inner London, although lower for School 1. The percentage of EAL children for Schools 1 and 2 for the targeted children was lower that the respective school-wide percentages for Schools 3 and 4 and higher for schools 1 and 2. School 2 had a relatively high EAL percentage for the targeted children that was in keeping with the school-wide statistic which in turn was higher than that for the Borough and Inner and Outer London. For all schools the percentage of children reported with special needs was higher than both the Borough and London averages. With regard to ethnicity, the profile for each school was broadly in keeping with schools across the Borough and in London, the exceptions being: a relatively high percentage of those classified as 'Asian and any other background' for School 1; a relatively low percentage of 'Black African' which was matched with a relatively high percentage for 'Black any other background' and 'Mixed White & Black African' for School 3 which also had a higher proportion of 'White British'; School 2 reported a much lower percentage of 'While British' both for the Borough and London generally. The numbers of male pupils in all schools outweighed those for females, with the greatest imbalance in the both the targeted and school-wide statistics shown for Schools 3 and 4. With regard to attainment, the available data for Schools 3 and 4 show over half the pupils to be middle attaining, the distribution is slightly skewed towards higher attaining for School 3 and lower attaining for School 4.

8. Project Impact

You should reflect on the project's performance and impact and use **qualitative and quantitative** data to illustrate this.

- Please complete the tables below before providing a narrative explanation of the impact of your project.
- Please state how you have measured your outcomes (e.g. surveys) and if you are using scales please include details.
- Please add graphical analysis (e.g. bar charts) to further demonstrate project impact on each teachers, pupils, wider system outcomes etc. If you use graphs, please ensure that all charts are explained and have clear labels for the axes (numeric data or percentages, for example) and legends for the data.

8.1 Teacher Outcomes

Date teacher intervention started: From Autumn Term 2013 (Summer Term 2015 for project extension) but see specific dates in Tables 9a to 9f below.

Table 9a: Teacher Outcomes: test scores for teachers benefitting from the project

Dates relate to first and second returns of data collection which were coincident with the start and finish of the Project intervention.

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
Increased	Written test	All 16 of the	% mark based on	% mark collected on	% mark collected on

teacher knowledge and understanding	questions accounting for up to 40 marks. Practical test up to 20 marks.	participating teachers listed individually below.	a score out of 60	dates shown below at the start of the intervention.	dates shown below at the end of the intervention.
		Teacher Y1 S1		11.7 22:4:2014	46.7 17:6:2014
		Teacher Y1 S2		12.5 22:4:2014	52.5 17:6:2014
		Teacher Y2 S1		15.8 5/3/2014	44.2 21/7/2014
		Teacher Y2 S2		12.5 5/3/2014	No data (school rearrangements)
		Teacher Y3 S1		25.0 16/1/2014	65.0 3/7/2014
		Teacher Y3 S2		25.8 16/1/2014	71.7 3/7/2014
		Teacher Y4 S1		35.0 14/12/2013	66.7 3/7/2014
		Teacher Y4 S2		28.3 21/11/2013	No data return (maternity leave)
		Teacher Y5 S1		14.2 19:11:2013	71.7 28:8:2014
		Teacher Y5 S2		28.3 19:11:2013	93.3 12:12:2013
		Teacher Y6 S1		25.8 9:1:2014	85.8 23:1:2014
		Teacher Y6 S2		47.5 9:1:2014	95.8 23:1:2014
		Teacher Y7 S3		8.3 16:12:2014	41.7 16:7:2014
		Teacher Y7 S3		5.0 16:12:2014	33.3 16:7:2014
		Teacher Y7 S4		29.2 14/7/2014	83.3 16:12:2014
		Teacher Y7 S4		12.5 14/7/2014	10.8 16:12:2014

TABLE 9b: Teacher Confidence

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	Written questionnaire	All 16 of the participating teachers listed individually below.	Combined mean score based on 17 1-5 scale items (1: very confident, 2: confident, 3:	Mean score collected on dates shown below.	Mean score collected on dates shown below.

			neither confident nor unconfident, 4: unconfident, 5: very unconfident)		
		Teacher Y1 S1		2.0 22:4:2014	3.5 17:6:2014
		Teacher Y1 S2		2.1 22:4:2014	3.8 17:6:2014
		Teacher Y2 S1		1.4 5/3/2014	1.5 21/7/2014
		Teacher Y2 S2		3.0 5/3/2014	No data (school rearrangements)
		Teacher Y3 S1		2.9 16/1/2014	3.9 3/7/2014
		Teacher Y3 S2		1.4 16/1/2014	2.8 3/7/2014
		Teacher Y4 S1		1.1 14/12/2013	3.6 3/7/2014
		Teacher Y4 S2		2.8 21/11/2013	No data return (maternity leave)
		Teacher Y5 S1		2.0 19:11:2013	4.0 28:8:2014
		Teacher Y5 S2		2.9 19:11:2013	3.5 12:12:2013
		Teacher Y6 S1		1.1 9:1:2014	3.9 23:1:2014
		Teacher Y6 S2		1.0 9:1:2014	5.0 23:1:2014
		Teacher Y7 S3		3.4 16:12:2014	3.4 16:7:2014
		Teacher Y7 S3		1.6 16:12:2014	2.8 16:7:2014
		Teacher Y7 S4		3.0 14/7/2014	3.9 16:12:2014
		Teacher Y7 S4		3.0 14/7/2014	2.1 16:12:2014

TABLE 9c: Self Efficacy

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
Increased teacher sense of self-efficacy	Written questionnaire consisting of 2 subscales: Efficacy in student	All 16 of the participating teachers listed individually below.	Combined mean score for each of two 1-9 subscales (8 items each) in response to “How much can you	Mean scores collected on dates shown below. SE / IS	Mean scores collected on dates shown below. SE / IS

	engagement (SE); Efficacy in instructional strategies (IS)		do?" (1: nothing, 3: very little, 5: some influence, 7: quite a bit, 9: a great deal)		
		Teacher Y1 S1		4.8 / 3.4 22:4:2014	5.6 / 6.0 17:6:2014
		Teacher Y1 S2		6.4 / 5.6 22:4:2014	8.1 / 8.6 17:6:2014
		Teacher Y2 S1		4.6 / 4.3 5/3/2014	6.3 / 6.1 21/7/2014
		Teacher Y2 S2		7.0 / 6.6 5/3/2014	No data (school rearrangements)
		Teacher Y3 S1		5.4 / 4.0 16/1/2014	8.0 / 7.5 3/7/2014
		Teacher Y3 S2		6.9 / 5.8 16/1/2014	6.9 / 7.0 3/7/2014
		Teacher Y4 S1		5.3 / 3.4 14/12/2013	6.5 / 4.5 3/7/2014
		Teacher Y4 S2		5.1 / 4.9 21/11/2013	No data return (maternity leave)
		Teacher Y5 S1		2.5 / 1.6 19:11:2013	8.0 / 6.8 28:8:2014
		Teacher Y5 S2		4.6 / 3.9 19:11:2013	7.3 / 7.5 12:12:2013
		Teacher Y6 S1		2.5 / 2.8 9:1:2014	6.3 / 6.3 23:1:2014
		Teacher Y6 S2		4.0 / 4.1 9:1:2014	7.8 / 7.6 23:1:2014
		Teacher Y7 S3		4.0 / 3.0 16:12:2014	4.6 / 4.5 16:7:2014
		Teacher Y7 S3		2.3 / 1.5 16:12:2014	2.8 / 2.0 16:7:2014
		Teacher Y7 S4		2.0 / 1.5 14:7:2014	7.3 / 6.8 16:12:2014
		Teacher Y7 S4		1.5 / 1.6 14:7:2014	4.5 / 3.9 16:12:2014

TABLE 9d: Evaluation of half-day school INSET review programme for teachers and teaching assistants for Years 1 to 6

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
Increased teacher knowledge	Written feedback form	18 teachers and teaching assistants	Combined mean score based on 4 1-4 scale items	Mean score collected on 22nd April 2014	n/a

and understanding		attending the half-day review.	(1: very helpful, 2: helpful, 3: not sure, 4: not helpful)		
				1.5	

Project extension

TABLE 9e: Test scores for teachers benefitting from the project extension

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
Increased teacher knowledge and understanding	Written test questions.	One Year 4 and one Year 6 teacher who participated in the project extension listed individually below.	% mark based on a score out of 28	% mark collected on 9th July 2015.	n/a
		Teacher Y4		93	
		Teacher Y6		89	

TABLE 9f: Confidence self-ratings for teachers benefitting from the project extension

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	Written questionnaire	One Year 4 and one Year 6 teacher who participated in the project extension listed individually below.	Combined mean score based on 14 1-4 scale items (1: very confident, 2: confident, 3: unconfident, 4: very unconfident)	Mean score collected on 9th July 2015.	n/a
		Teacher Y4		1.1	
		Teacher Y6		1.9	

Table 10 – Comparison data outcomes for Teachers *[if available]* – n/a

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

8.1.1 Please provide information (for both the intervention group and comparison group where you have one) on:

- Sample size, sampling method, and whether the sample was representative or not
- Commentary on teacher impact (please also refer to table 5 re impact on different groups of teachers)
- Qualitative data to support quantitative evidence.
- Projects can also provide additional appendices where appropriate.

The intervention group consisted of 16 teachers: 12 primary teachers (one teaching a class in each year-group from Years 1 to 6 in each of two primary schools) and 4 secondary teachers (two from each of two secondary schools and teaching Year 7 classes). The teachers and classes were from 4 participating schools that were selected because they were linked (an executive head teacher responsible for the two primary schools) needed to deliver a coherent computing curriculum. This is a small sample and as a Standard 1 project there is no comparison group. Although for each school and year-group the sample of teachers is too small to make meaningful wider comparisons, the executive head of the two participating primary schools in an interview expressed the opinion that they were much better placed that many other schools. This comment reflected both staffing and digital resources, the executive head noting during an interview that ‘A lot of money is invested in ICT [...] there is an ongoing replacement cycle, often 3 years, of equipment such as laptops and iPads [...] every child has a device which they can take home every night’.

Initial evidence of impact on teachers was obtained from the difference between their pre- and post-test and post-intervention questionnaire returns. These were administered at the beginning and end of the three days of training and the findings tabulated in Tables 9a to 9c and summarised graphically in Figures 1 to 4.

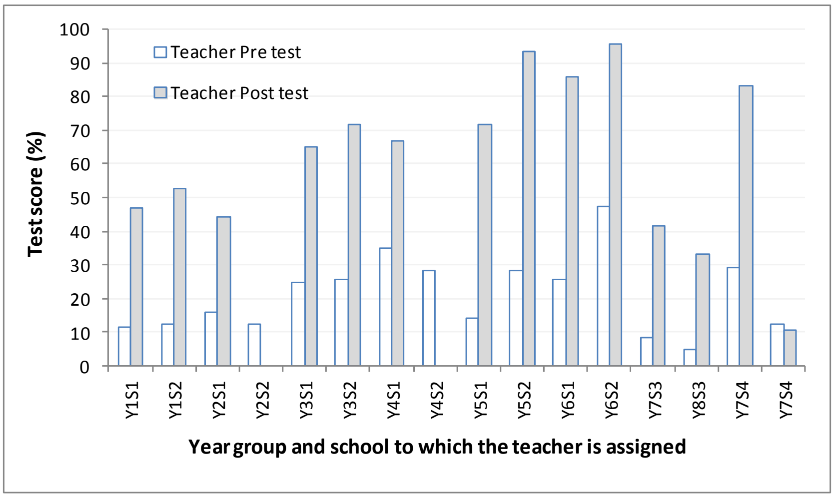


Figure 1: Pre- and post-test scores (%) for the teachers taking part in training arranged according to each school (S1 and S2) and their assigned pupil year-group.

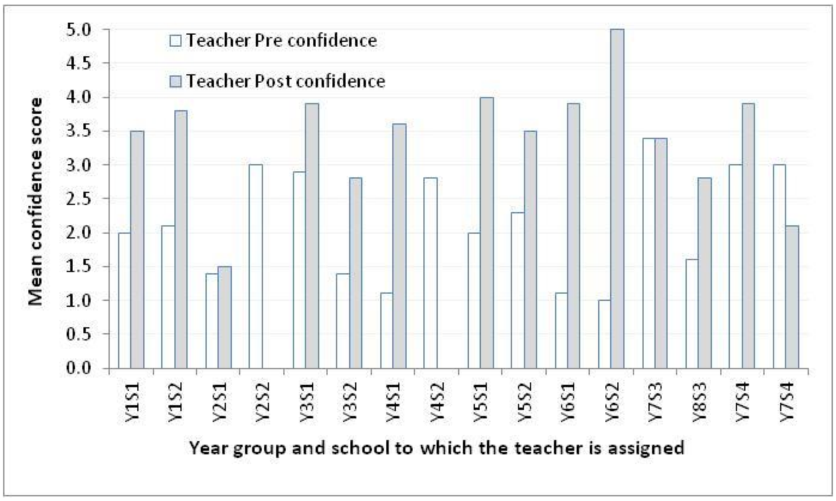


Figure 2: Pre- and post-confidence scores (out of 5) for the teachers taking part in training arranged according to each school (S1 and S2) and their assigned pupil year-group.

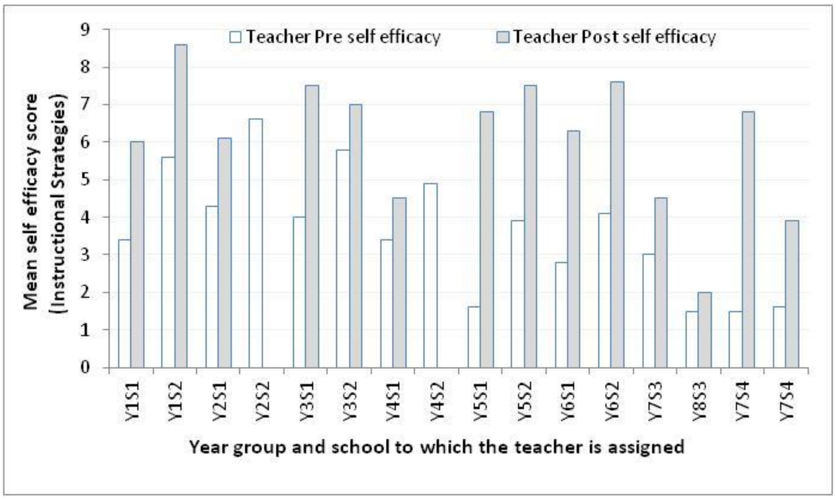


Figure 3: Pre- and post-self efficacy (Instructional Strategies) scores (out of 9) for the teachers taking part in training arranged according to each school (S1 and S2) and their assigned pupil year-group.

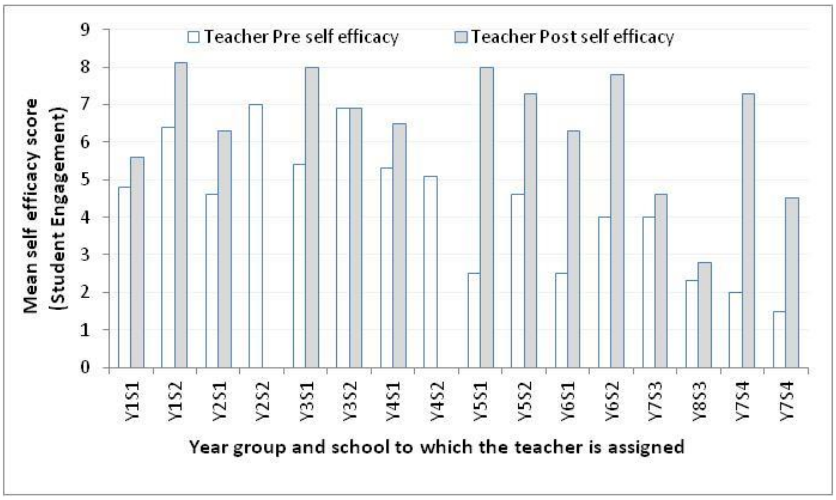


Figure 4: Pre- and post-self efficacy (Student Engagement) scores (out of 9) for the teachers taking part in training arranged according to each school (S1 and S2) and their assigned pupil year-group.

Although differences in scores for individual teachers are apparent across the participating teachers on the Project, impact at this stage occurred as expected insofar that the tests indicated broadly an increase in skills and subject knowledge, and the questionnaires broadly suggested an increase in confidence and self-efficacy, both with regard to Instructional Strategies an Student Engagement. Departures from the overall trend can be seen for the Year 7 teachers where, apart from one exception, both pre- and post-test scores were comparatively low with one teacher obtaining a lower post-test score that was lower than for the pre-test, this was also reflected on the confidence scale for the teacher concerned. Observations made by the external evaluator were consistent with those fed back from the Key Stage 2/3 trainer insofar that the Year 7 teachers were not only unfamiliar with programming but not ready to meet the additional secondary level demands. This countered the expectation by the trainer that the teachers would have a higher aptitude for programming based on their background as specialists in supporting ICT. Because of a lack of familiarity and readiness to acquire programming concepts, the details of syntax requirements for a text-based language such as Python that would have been used in training were regarded by the trainer concerned as a barrier and distraction to understanding basic programming concepts. As a result, the starting point of the intervention had to be revised in that all of the secondary teachers needed to use a visual programming language such as Scratch to illustrate basic programming concepts.

Finally, it should be noted that the evaluation of the half-day school INSET review that took place for teachers and teaching assistants for Years 1 to 6, and summarised in Table 9d, was reported by the 18 attendees using the four point scale as either very helpful (a slight majority), or helpful. There was only one scale item (relating to examples of algorithms and Scratch programs) marked by only one respondent as 'not sure'.

With regard to the third teacher outcome (Table 1) relating to access to quality training materials, prior to the intervention there was an absence of teacher understanding, skills and knowledge of computer programming. The trainers designed and produced age-appropriate teaching materials for each year group and these materials were used to upskill the teachers and were then implemented by the teachers in the classroom to upskill their pupils. As a result of the intervention both teachers and pupils showed improved understanding and acquisition of programming knowledge, skills and concepts as evidenced in their post-test results. The materials have been adopted by the schools in their schemes of work.

Regarding the fourth teacher outcome (Table 1) on understanding the progression of skills in computer programming and the pupils' learning journey, progress moved from a point where neither understandings nor an assessment framework were evident in the schools. At the start of the project there was an absence of DfE guidance on pupil assessment and progression although the National Curriculum for Computing had been recently published. The assessment criteria used by the Project aligned well with the later published Computing at School (CAS) assessment framework and as a result a merged version was finalised and adopted by the schools. As a result of intervention, progression in programming was covered in whole-school staff meetings, where teachers shared with each other their experiences of pupils' learning and activities across the key stages.

Progression of programming skills and knowledge was further disseminated at a borough-wide meeting for Lewisham Key Stage 1-2 teachers. The trainers and the teachers from the project schools shared information, experiences and teaching resources with delegates. In response to questionnaire items on feedback forms for the borough-wide meeting relating to pupil learning and progression, and to linking of the handouts and content to the assessment framework, all teachers indicated that the input and activities were either 'helpful' or 'very helpful'.

Project extension

The intervention group for the Project extension consisted of a total of four teachers: one from Reception, Year 1, Year 4 and Year 6, all from School 1. The teachers and classes from the participating primary school were selected because it was thought that continuity in pupils and teaching staff from the original Project would minimise unforeseen factors that might have arisen when pursuing the aims of the extension. This is a very small sample, again with no comparison group, the intention being to explore the viability of innovative approaches to programming for the Reception and Year 1 pupils and the viability of including other curriculum areas for the Year 4 and Year 6 classes as detailed in Section 2.

From the quantitative findings presented in Table 9e it is apparent that both Year 4 and Year 6 teachers obtained relatively high scores in the tests relating to the subject knowledge and skills needed when working with their designated classes. This was also matched by relatively high confidence self-reports (Table 9f). For Reception and Year 1, the focus primarily on the work of a very small number of pupils was of an experimental nature involving less well-established technology. Although the teachers were inducted into this work, equivalent quantitative data were not obtained.

8.2 Pupil Outcomes

Date pupil intervention started: October 2013

Table 11a: Pupil Outcomes for pupils benefitting from the project
Date pupil intervention started: Same as that for 1st data return. All scores expressed as %

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
Increased pupil	*Written test questions*	16 of the targeted	Mean % mark for each class based	% mark collected on	% mark collected on

knowledge and understanding	*accounting for up to 40 marks. Practical test up to 20 marks.*	participating classes listed according to year-group and school below. (Number of pupils for data obtained on both returns.)	on a score out of 60	dates shown below.	dates shown below.
		Y1 S1		20.3 13/5/2014	69.2 22/7/2014
		Y1 S2		18.5 12/5/2014	62.1 21/7/2014
		Y2 S1		31.0 16/6/2014	74.1 14/7/2014
		Y2 S2		28.2 16/6/2014	67.3 16/7/2014
		Y3 S1		13.8 10/2/2014	56.3 14/6/2014
		Y3 S2		7.5 3/2/2014	33.1 15/4/2014
		Y4 S1		15.9 5/12/2013	54.3 14/12/2013
		Y4 S2		13.6 12/12/2013	37.1 14/12/2013
		Y5 S1		20.0 2/12/2013	63.8 26/06/2014
		Y5 S2		5.6 2/12/2013	59.0 12/12/2013
		Y6 S1		17.2 16/05/2014	66.5 14/07/2014
		Y6 S2		18.0 16/05/2014	Data lost by teacher who moved to a new school
		Y7 S3		11.0 2/5/2014	48.0 16/7/2014
		Y 7 S4		8.0 4/9/14	66.0 Dec 2014
		Y 7.1 S4		6.2 9/9/14	57.8 Dec 2014
		Y 7.2 S4	(With trainer support)	5.6 9/9/14	41.0 Dec 2014
		Y 7.3 S4	(Without trainer support)	4.6 4/9/14	17.6 Dec 2014

Project extension

For the purposes of the project extension, pupil assessments were summarised in terms of three broad categories: 0% to <50% categorised as 'Emerging', 50% to <80% as 'Ready to Progress' and ≥80% as 'Exceeding'. Scores were obtained on assessed pupil activities validated by trainer, answers to questions, the quality of written content in pupil workbooks, and on self developed pupil 'I can' statements completed at the end of each relevant session which were also validated by the trainer. For Year 4 and Year 6 pupils, comparisons were made with the data from Project extension to those data from the same cohorts of children in their previous school year obtained in the initial project, the latter being used as an indicative baseline. For Reception and Year 1 pupils, the content being taught was regarded as innovative and the only assessments available are those made towards the end of the intervention. Only 4 pupils were involved in each of these groups and the focus of this aspect of the extension was to judge the viability of the teaching methods and content as opposed to making a formal comparison or progress in relation to a baseline. The quantitative data reported reflect 'best fit' judgements for each pupil in relation to the new age-related standards being adopted within the new National Curriculum.

Table 11b: Pupil Outcomes for pupils benefitting from the project extension

Date pupil intervention started: April 2015

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
Increased pupil knowledge and understanding.	Written test questions; Practical test; 'I can' statements.	4 of the targeted participating classes listed according to year-group and school below. (Number of pupils for data obtained on 2nd returns.)	% of pupils in each assessment category: Em = Emerging; R = Ready to Progress; Ex = Exceeding. Collected Summer 2014.	% of pupils in each assessment category: Em = Emerging; R = Ready to Progress; Ex = Exceeding. Collected Summer 2014. Em R Ex	% of pupils in each assessment category: Em = Emerging; R = Ready to Progress; Ex = Exceeding. Collected Summer 2015. Em R Ex
	Computing	Reception (4)		n/a	15 45 40
	Computing	Year 1 (4)		n/a	25 35 40
	Computing	Year 4 (29)		34 58 8	7 41 52
	Science	Year 4 (29)		n/a	14 34 52
	D&T	Year 4 (29)		n/a	14 34 52
	Music	Year 4 (29)		n/a	7 38 55
	Computing	Year 6 (29)		17 47 37	10 48 42
	Science	Year 6 (29)		n/a	7 38 55
	D&T	Year 6 (29)		n/a	10 48 42

Table 12 - Pupil Outcomes for pupil comparison groups *[if available]* – n/a

Target	Research	Sample	*Metric used*	1st Return	2nd Return

Outcome	method/ data collection	characteristics		and date of collection	and date of collection

8.2.1 Please provide information (for both the intervention group and comparison group where you have one) on:

- Sample size, sampling method, and whether the sample was representative or not Commentary on pupil impact (please also refer to table 6-8 re impact on different groups of pupils)
- Qualitative data to support quantitative evidence.
- Projects can also provide additional appendices where appropriate.

The intervention group consisted of 16 classes with approximately 30 pupils on roll. Twelve of the classes were based in two primary schools (one class from each year-group from Years 1 to 6 in each of two primary schools), and the remaining four classes, two from each of two secondary schools, consisted of Year 7 pupils. The classes were taught by the teachers as detailed above and were from 4 participating schools that were selected because they were linked and needed to deliver a coherent computing curriculum. This is a small sample and as a Standard 1 project there is no comparison group.

The difference between their pre- and post-test scores and teacher-assessed practical work carried out during the final lesson of the trial period were taken as an indicator of the impact of the intervention on pupils. The tests were administered at the beginning and end of the trial period spanned by the lessons modelled by the trainers and lessons subsequently taught by the teachers, and the findings tabulated in Table 11a are summarised graphically in Figure 5. From On this basis, the impact of the intervention on pupils was evident over the period. The main departure from this trend was apparent with the Year 7 class working with the teacher mentioned above who obtained low post-test and low confidence scores; here the increase in pupil post-test scores was modest and lower than the other classes for which data were obtained.

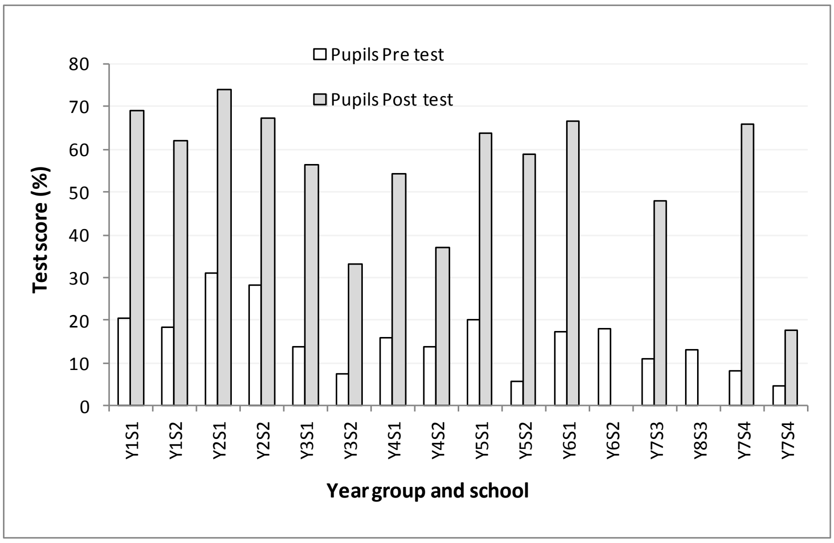


Figure 5: Average pre- and post-test scores (%) for each class of pupils taking part in training arranged according to each school (S1 and S2) and year-group.

With regard to pupils, the average pre-test scores obtained for each class in each year-group for each school were all relatively low (ranging from approximately 5 to 30%). Post-test scores for each group of pupils were higher than their pre-test scores in all cases for the data obtained, with the majority falling with a range of around 50 to 70%. Figure 5 shows the average pre- and post-test scores for each class of pupils taking part in training arranged according to each school (S1 and S2) and year-group. Again, if the post-test scores are assumed to be partly attributable to the intervention then a case could be made for the impact of the project as far as the pupils are concerned. However, further inspection of Figure 5 suggests that both pre- and post-test scores for each year-group for School 1 are slightly higher than for each corresponding year-group for School 2. In this context it may be noted that from the key beneficiary data reported in Section 6.2 the proportion of pupils with FSM, FSM in the last 6 yrs, EAL and SEN categories is higher in all cases for School 2. This trend is less consistent for the difference scores.

With regard to Pupil Outcome 2 (Table 1), transition to text-based programming was originally designed to be delivered to Year 7 pupils as well as the Year 6 cohorts. Delivery to Year 6 cohorts was planned to follow on and build on their experience of visual programming using Scratch. This would also enable the trainer to assess the effectiveness of the Year 6 Scratch lessons as a vehicle for teaching programming concepts thereby allowing pupils to focus upon the syntax demanded by the text-based language Python. Year 6 pupils spent a day learning programming techniques using Python in accordance with the Key Stage 3 Programmes of Study. During these classroom sessions taught by the trainer who was supporting Year 7 teachers, a large majority of the Year 6 pupils completed the work that was set with enthusiasm and pride regarding their achievements. The sessions were observed by the external evaluator and although some minor difficulties were encountered at first, some pupils reported that they found Python 'really easy'. Furthermore, from inspection of the pupils' scripts, both the teachers and the trainer reported that most of the children had performed very well and the remainder who were of lower general ability also did well even though they needed support. In view of this, overall, the progression route from Key Stage 3 to Key Stage 3 was judged to have been very effective. The original plan was for the Year 7 teachers to deliver the Python session. However in view of the very low pre-intervention test scores for these teachers and a an extreme nervousness of teaching programming, the Key Stage 2 materials were regarded as a more suitable starting point for them and their pupils.

The extent to which Pupil Outcome 3 on career paths could be addressed was limited by the scope of the Project, but to some extent this was addressed through qualitative data. Apart from teachers expressing that the skills obtained would offer more opportunities for pupils to consider a greater range of careers, there was a general enthusiasm for computing backed up by some Year 5 pupils in an interview with the external evaluator expressing an enthusiasm for computing as a future career.

Project extension:

As noted above, pupil assessments for the project extension were summarised in terms of the three categories 'Emerging', 'Ready to Progress' and 'Exceeding'. From the findings summarised in Table 11b it is apparent that the majority of pupils in both Reception and Year 1 could be regarded as 'Ready to Progress' and 'Exceeding' in terms of the work initiated by the intervention. This related to writing simple algorithms and representing them pictorially, implementing algorithms as simple programs on the Cubetto floor robot, using logical reasoning to predict the behaviour of the programs created, understanding that computers cannot think for themselves, and following and giving a simple sequence of instructions.

With regard to the outcomes for Reception and Year 1, the use of the Cubetto Playset was trialled and video evidence obtained of pupils' ability to apply basic programming logic so that the robot could follow pre-determined routes from one grid position to another successfully. From the range of children observed, the Cubetto Playset was judged to be an effective tool for introducing young learners to programming.

For Years 4 and 6, comparisons with the Project extension data to those data obtained from the same cohorts of children in their previous school year in the initial project, suggested a move away from 'Emerging' and towards either 'Ready to Progress' and 'Exceeding' which was particularly pronounced with the Year 4 pupils (Table 11b). The Year 4 unit involved science activities (including understanding and constructing electrical circuits) a large majority of both of the above year groups also fell into the either 'Ready to Progress' and 'Exceeding' categories with an emphasis on the latter category. This pattern was also evident for the music activities where the pupils applied their knowledge of circuits to construct a 'Makey Makey' piano with which they composed a ringtone using music software such as 'Garageband'. Music was continued as the theme for developing programming concepts in Scratch of sequencing and loops based on their use of sequencing and loops in their ringtone compositions. Comments from an interview with a Year 4 teacher were indicative of the success of the activities: " …it's been brilliant, all the children met their learning intentions ...it was well paced … everyone was engaged, working very hard and really excited about what they were doing … it was really lovely … sometimes when you're teaching its quite hard to get children excited, … their recall was incredible…".

The Y6 unit extended pupils' understanding of circuits and the relevance of circuits in computer hardware. The pupils constructed 'blinking robots' by incorporating an LED circuit in their A4 paper poster. This was followed by a meaningful investigation of electrical circuits in a computer keyboard, and decoded binary messages. The keyboard activity provided a window for a basic introduction to computer architecture – electrical circuits, binary and bits. Most of the children met or exceeded the learning intentions in the blinking robots and keyboard activities. With regard to the outcome for Year 6 on the second part of the unit, improved knowledge and skills related to robotics involving Cubetto, technical problems arose due to a hardware mismatch. While this allowed some initial steps on coding the robot to be addressed, it was not possible to carry this through to the extent expected.

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
Borough of Lewisham Primary Conference					
Teachers outside the intervention group have access to exemplars of good practice and better resources aimed at increasing knowledge and understanding of	*Paper survey*	*Surveys completed by all participating teachers*	*Combined mean score based on 11, 5 point scale items (1: very unconfident, 2: unconfident,*	*Background questionnaire and confidence scale completed at the start of the 1-day*	*Questionnaire and confidence scale completed at the end of the 1-day conference*

the new National Curriculum requirements in Computing and confidence when teaching.			*3: neither confident nor unconfident, 4: confident, 5: very confident)*	*conference held on 30th June 2014.*	*held on 30th June 2014*
		N=16		*2.4*	*3.5*
Two-day London-wide Workshop	*Paper survey*	*Surveys completed by all participating teachers*	*Combined mean score based on 11, 5 point scale items (1: very unconfident, 2:unconfident , 3: neither confident nor unconfident, 4: confident, 5: very confident)*	*Background questionnaire and confidence scale completed at the start of the 2-day conference held on 8th July 2014.*	*Questionnaire and 4 item 4 point rating of workshop help re knowledge and pedagogical skills (1: not at all, 2 a little, 3 moderately, 4 greatly) completed on 9th July 2014 at end of 2-day conf.*
		N=12		*2.6*	*3.5*

8.3.1 Please provide information on

- Sample size, sampling method, and whether the sample was representative or not
- Commentary on wider system impact qualitative data to support quantitative evidence.
- Projects can also provide additional appendices where appropriate.

The wider system sample for the Borough of Lewisham Primary Conference consisted of 24 teachers from 13 mainstream primary schools that were largely representative of the majority of those within the Borough. These were teachers who responded to an invite to the Conference that was sent by e-mail to every primary school in the Borough.

The sample for the two-day London-wide Workshop (held at Goldsmiths University) consisted of 20 teachers based in London and broadly representing the majority of the mainstream schools found across London. These were teachers who had responded to an advert on the Goldsmiths University Website, with the bookings processed administrators at Goldsmiths on a first-come, first-served basis. The number of applications exceeded the number of places offered (20), with a waiting list in the event of cancellations.

Wider school outcomes were apparent through the half-day school review and from the one-day primary school conference attendance and the post-conference questionnaire associated with this. The findings summarised in Table 13 are consistent with the direction of impact expected.

It has already been noted above that the evaluation of the half-day school INSET review summarised in Table 9d, suggested that the 18 teachers and teaching assistants who attended was regarded either as very helpful (a slight majority), or helpful.

With regard to wider system impact, for the primary school conference, the mean scores shown in Table 13 also represent the majority ratings given by 16 teachers who completed both the pre-conference and post-conference questionnaire out of the 24 teachers from 13 schools that attended. The pre-conference rating fell between ‘unconfident’ and ‘neither confident nor unconfident’ while the post-conference rating lay between ‘neither confident nor unconfident’ and ‘confident’.

A wider system impact is suggested from the two-day workshop attendance, which was over-subscribed, and the pre- and post-workshop questionnaires relating to knowledge of programming, computing in the new National Curriculum and the associated pedagogical skills. Here, the combined mean score from the 12 of the 20 teachers who completed both the pre-and post-questionnaires showed a move from between ‘unconfident’ and ‘neither confident nor unconfident’ on a five point scale, to midway between a rating of ‘moderately’ and ‘greatly’ on a four point scale regarding the help of the workshop on knowledge and pedagogical skills. Although the scales were expressed slightly differently in format, this does not detract from a general interpretation of the trend.

Dissemination of teaching resources on Computing At School (CAS) and other websites occurred during the intervention period as intended. Another outcome was the school ICT audit which was not part of the Project but happened as a result of it and became part of the school development plan.

With reference to the wider systems outcome on partner schools becoming ‘Centres of Excellence’, skills and resource developments have been shared through borough-wide meetings. Although within the remit of the Project there are limitations to the extent that this can be maintained, teachers continued to build confidence to continue the initiatives and share expertise. Moreover, the intention of School 1 to become a leading school in computing is evident in its mission statement.

Since the Project extension was focused on developing and refining pedagogical approaches in classrooms within a single school, there is no commentary on any wider system outcomes for this aspect of the work.

8.4 Impact Timelines

Please provide information on impact timelines:

- At what point during/after teacher CPD activity did you expect to see impact on teachers? Did this happen as expected?
- At what point during/after teacher CPD activity did you expect to see impact on pupils? Did this happen as expected?
- At what point did you expect to see wider school outcomes? Did this happen as expected?
- Reflect on any continuing impact anticipated.

Based on the test and questionnaire findings, impact on teachers’ knowledge and understanding, self efficacy and confidence was measurable within the time span of the training intervention. As the training period was clearly delineated within a relatively short time frame the impact was as expected, At the point where teachers began work with pupils and taking responsibility for putting the training into practice in their class teaching the impact was less pronounced in that teachers worked with the trainers who modelled parts of the lessons with pupils. Apart from the one Year 7 class already noted, based on pre- and post-test results, impact upon pupils was detectable within the time span of the lessons with the teachers and trainers.

Tailor made teaching materials and assessment booklets were also available for all year groups so that they could be used effectively throughout the intervention as needed.

Wider school outcomes were expected to be apparent through the half-day school review. From the rate of attendance and completed evaluation returns for Years 1 to 6 that were summarised in Table 9d, direct and timing of the impact would have occurred as expected. The half-day review also acted as a preliminary element in writing of the school development plan and, although this did not take place on the same date, nevertheless which took place within the school year and term of the Project.

Wider system impact was evident and in the direction as expected. This was shown by the rate of attendance, timing and evaluation returns from the one-day Borough-wide conference and two-day workshop. Through these events teaching and learning resources were shared effectively with the wider community and arising from the two-day workshop, a large number of schools represented by the attendees claimed to be using the resources designed within the Project for Key Stages 2 and 3.

With regard to continuing impact, the Project raised awareness of the range of demands involved when teaching Computing and impact was evident in the demand and take-up of additional support with money used from the primary workshop under-spend and the Project extension.

With regard to the generalist nature of primary teachers, the view was expressed by the Key Stage 2 trainer that continued effective development of subject knowledge would depend on further input distributed over a sustained and longer period of time (perhaps around a school year) complementing the initial training intervention. It was felt that some Key Stage 2 teachers would continue to struggle regardless of input, perhaps due to motivational issues and capability. Also, some of these teachers has senior managerial roles and were inundated with other concerns and responsibilities which did not allow them to fully engage with the demands of the Project.

Regarding secondary level, one teacher who was in role as an ICT specialist, was reported by the trainer as finding the move into computer programming relatively challenging. This, as already noted could have arisen from the higher level of demand on subject knowledge that needed at primary. This situation was followed by the school’s intention to subsequently replace the ICT role with that of a computing specialist. This in some ways could underline the dangers of assuming that a specialism in ICT automatically brings with it expertise in programming and may foretell similar moves to be taken in other schools.

9. Reflection on overall project impact

In this section we would like you to reflect on:

- The overall impact of your project
- The extent to which your theory of change proved accurate

- How your project has contributed to the overall aims of LSEF
- Whether your findings support the hypothesis of the LSEF
- What your findings say about the meta-evaluation theme that is most relevant to you

This is a project that, although concerned primarily with the new Computing Curriculum implemented in schools, had a broad compass in that it addressed gains in knowledge and skills on behalf of the pedagogy of the teachers, gains in pupils' learning and the wider system outputs for all year groups at primary level as well as the transition into Year 7 at secondary level. Within the scope of this relatively small project in terms of the numbers of schools as pupils and funding resources involved it would be, of course, premature to make claims that the findings are in any way robust. The methodological limitations have been outlined in Section 4 and at best, therefore, the discussion below can only be speculative.

Although numerous rearrangements in the scheduling of the interventions with teachers and pupils were necessary in view of demands arising at short notice within each school, the interventions were all administered. From the average pre-intervention test scores the baseline knowledge and skill level for all but two of the teachers was relatively low (less than 30%), with the scores for the remaining teachers 35.0% and 47.5%. Post-test scores for teachers were higher than pre-test scores in all cases (with two teachers exceeding 90%). Most teachers, then, appear to have benefitted in terms of subject knowledge and pedagogical skills. Similarly benefits in confidence and self efficacy from the intervention were obtained regardless of the initial levels indicated by the pre-test and pre-questionnaire scores.

In most instances higher post-test scores in subject knowledge and understanding were obtained from teachers with higher pre-test scores and the scatter plot shown in Figure 6 suggests a positive correlation ($r = 0.781$, $p \leq 0.001$). Although this finding is in some ways inevitable, it suggests, importantly, that the returns from the training did not diminish for those teachers already starting with a higher level of knowledge and understanding. A more detailed analysis on the test data was also carried out in relation to three main strands of the test, namely, those items testing logical reasoning, a general understanding of computer technology and a knowledge and understanding of programming both in theory and through practical application. From this analysis it appears that the greater proportion of the scores obtained in the pre-test were for items relating to logical reasoning and understanding of the technology. The scores obtained for logical reasoning and understanding of the technology were largely carried over into the post-test so that the differences in pre- and post-test overall scores were mainly due to increases in a knowledge and understanding of programming. This pattern was to some extent also reflected in the pupil scores which are discussed below. If the post-test scores are assumed to be partly attributable to the intervention then a case could be made for the impact of the project as far as the teachers are concerned.

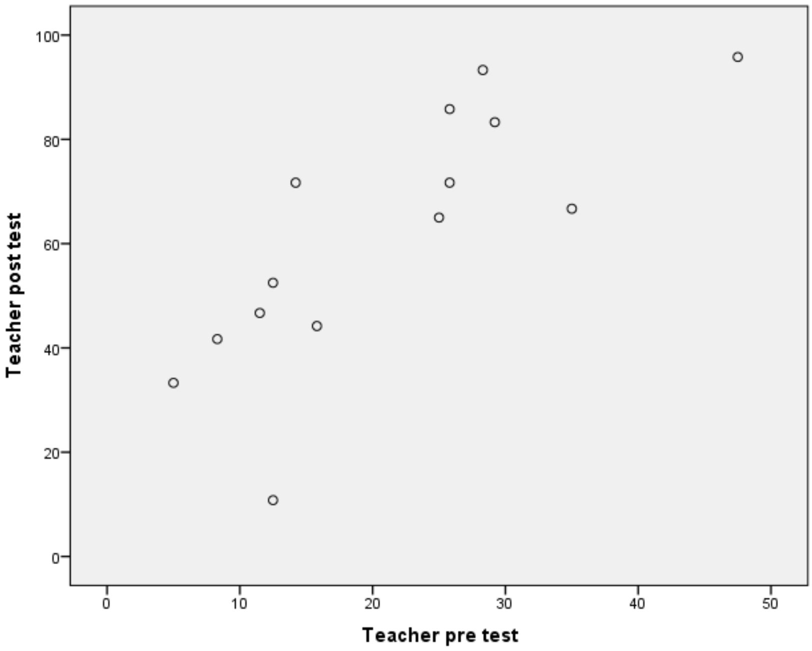


Figure 6: Scatter plot based on the pre- and post-test scores (%) shown in Figure 1 for the teachers taking part in training.

With regard to pupils, again, if the post-test scores are assumed to be partly attributable to the Project intervention then a case could be made for the impact of the Project as far as the pupils are concerned. The average pre-test scores obtained for each year-group for each school were all relatively low (ranging from around 3 to 30%). Post-test scores for each group of pupils were higher than their pre-test scores in all cases, with the majority falling with a range of around 50 to 70% (Figure 5). In most instances higher post-test scores in subject knowledge and understanding were obtained from pupils with higher pre-test scores and the scatter plot shown in Figure 7 suggests a positive correlation ($r = 0.667$, $p \leq 0.01$). As with the teachers, the finding in some ways inevitable, also suggests that any impact from the lessons did not diminish for pupils starting with a higher level of knowledge and understanding. Also, as with the teachers, scores obtained for logical reasoning and understanding of the technology tended also to be carried over from pre- to post-test, so that the differences scores were mainly due to increases in a knowledge and understanding of programming.

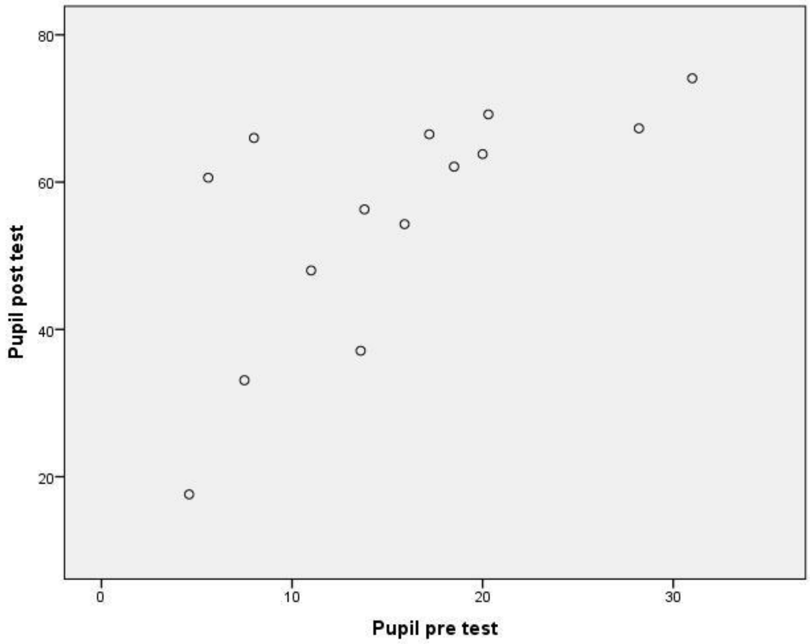


Figure 7: Scatter plot based on the pre- and post-test scores (%) shown in Figure 1 for the pupils taking part in training.

Teacher post-test scores alone do not appear to relate directly to pupil post-test scores. Figure 8 shows the post-test scores (in %) for the teachers and average post-test scores (in %) for each class of pupils arranged according to school and pupil year-group and Figure 9 shows the corresponding scatter plot. No clear trend between these two variables is discernible from inspection of the scatter plot ($r = 0.484$, $p > 0.05$). However, although very speculative in view of the small sample size, a trend is apparent when post-test scores for the teachers and the average pre- and post-test difference scores for each respective class of pupils are considered (Figures 10 and 11; $r = 0.724$, $p \leq 0.01$). If the test scores are representative of subject knowledge of the teachers and the performance of the pupils, then one possible interpretation is that there is an association between these measures. Accounting for the differences in impact for each group of pupils, however, would require consideration of contextual data regarding each cohort of pupils and the relevant teachers that is beyond the scope of this study.

It should be noted, though, that this latter trend in pupil pre- and post-test difference scores is not reflected in the case of confidence ratings obtained from the teacher post-questionnaire where no significant association with pupil pre- and post-test difference was found ($r = 0.547$, $p > 0.05$). Similarly, no significant association was found regarding teacher self efficacy with either the Efficacy in Student Engagement: ($r = 0.452$, $p > 0.05$), or Efficacy in Instructional Strategies ($r = 0.474$, $p > 0.05$).

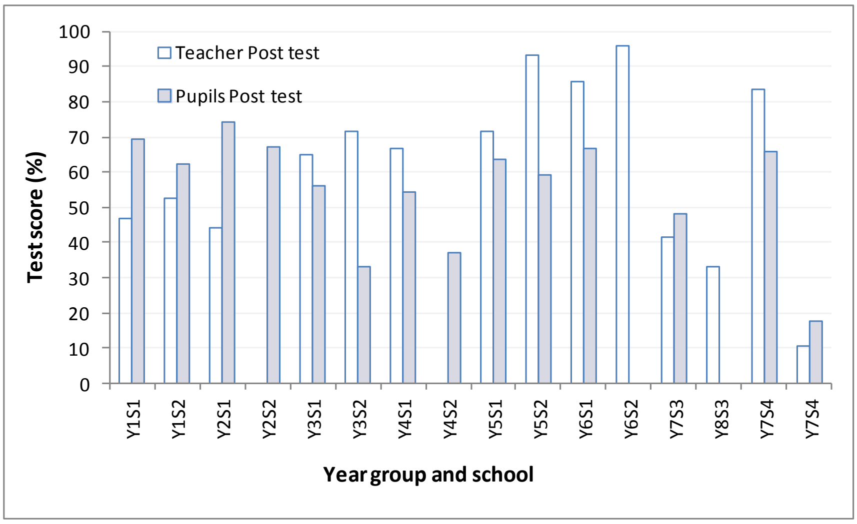


Figure 8: Post-test scores (%) for the teachers and average post-test scores (%) for each class of pupils taking part in training, arranged according to each school (S1 and S2) and pupil year-group.

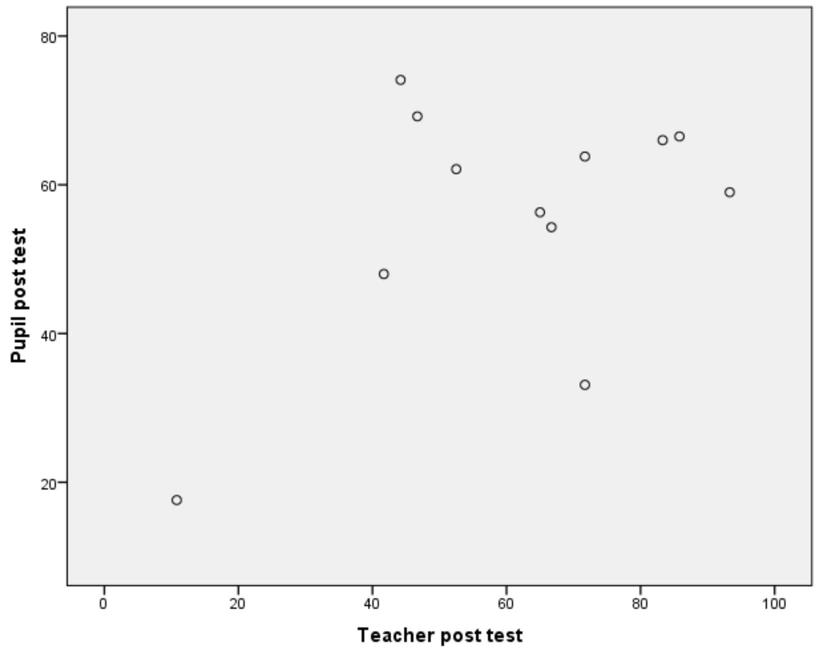


Figure 9: Scatter plot based on the post-test scores (%) for teachers and the average post-test scores (%) for each class of pupils taking part in training as shown in Figure 4.

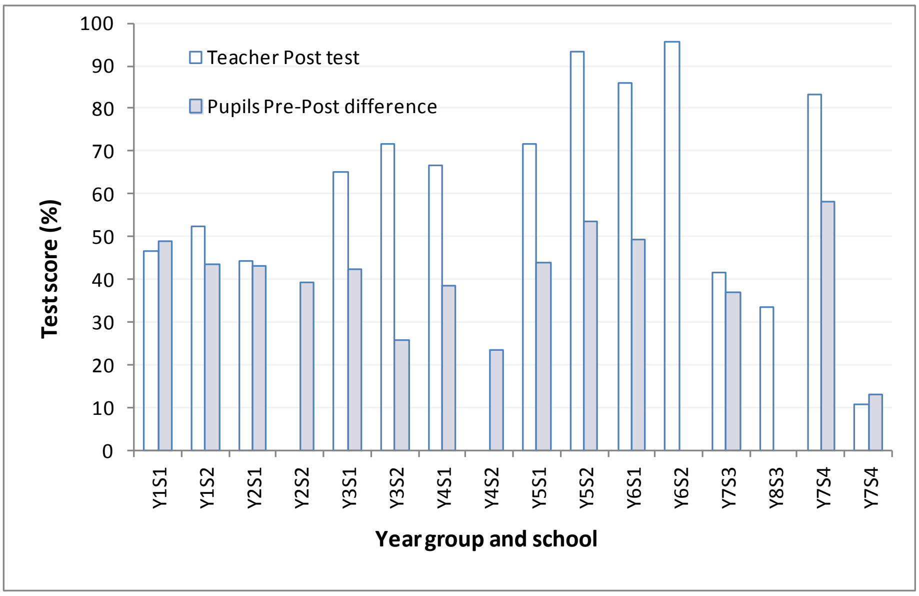


Figure 10: Post-test scores (%) for the teachers and the average pre- and post-test difference scores (%) for each class of pupils taking part in training arranged according to each school (S1 and S2) and pupil year-group.

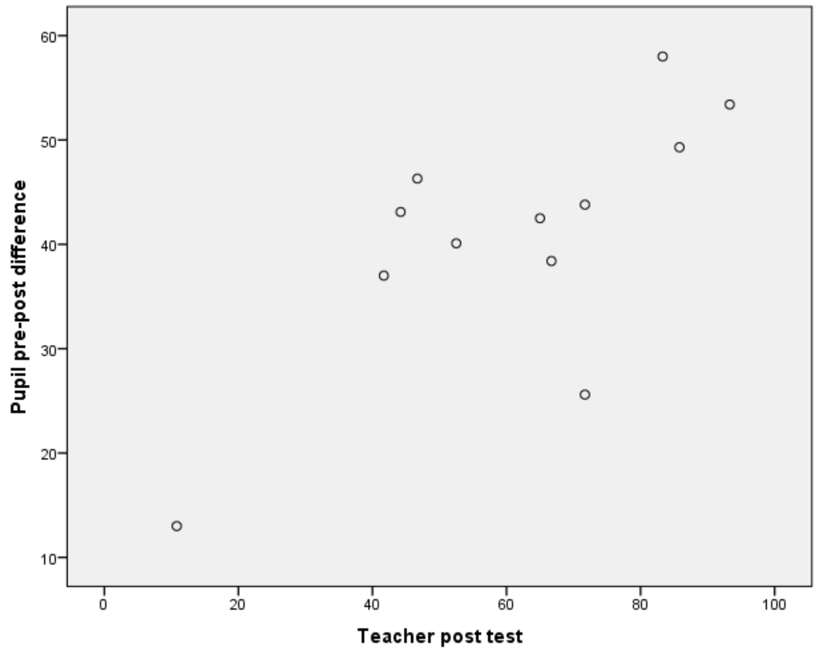


Figure 11: Scatter plot based on the teacher post-test scores (%) and the difference between average pre- and post-test difference scores (%) for each class of pupils as shown in Figure 6.

Taken together, then, the data presented in the above figures could be seen to be consistent with the notion that improved subject knowledge could lead to improved pupil outcomes. On the available Project data, however, this conclusion is speculative and not evident of a direct causal relationship. Similarly, the data do not suggest and improved pupils outcomes are mediated by teacher confidence or self efficacy.

Other qualities of the Project became evident through qualitative feedback gathered through interviews and observations. For example, benefits from working and networking with other schools were voiced. In interview, the executive head of the primary schools made it clear that '...networking is important for the professional development of ICT coordinators. Conferences can be helpful but tend to be marketed and prescriptive. Better to chat with others from schools and develop networks. I draw from different networks.' The ICT coordinators in each school were regarded as an important focus and having time to work together and with the trainer had key benefits regarding the curriculum, auditing and action plans, monitoring. The importance of links between school was also echoed in an interview with the head teacher of one of the primary schools: 'As primary schools are often one-form entry, teachers do not have year-group partners, therefore going to each others' schools is important and the teachers working on the Project had to get to know each other.'

In addition to the measured pupil outcomes, qualitative data revealed an enthusiasm for computing. In the words on one Year 3 teacher 'The kids really loved it, especially those that don't always excel have pride in themselves'. During an observation of a Year 5 class made by the external evaluator some of the pupils also expressed an enthusiasm for computing as a future career.

The availability of the variety of teaching materials developed within the project was an important ingredient in sustainability. The units introduced in the Project would be adopted and in addition to their online availability, wider school and wider system events can also be seen as contributing in this respect. Among the factors that contributed to sustainability were, according to the executive primary head '...solid schemes of work teachers can pick up to make something of and teachers can do things with [the trainer's] support'. It was also felt that continued availability of the Project trainer would be an asset and would help in the development of an ICT audit tool along with a school action plan. In reference to anything else that needs to be in place to sustain the Project and achieve improvements in pupil outcomes, it was stated by the executive head that it is important to build on the work of the Project to get ICT embedded and cover objectives systematically through a topic-based approach, but avoiding artificial links. In terms of the demands, the executive head also pointed out that teachers need time to make progress with programming needed to meet pupil entitlement. This is the biggest requirement, especially with a completely new curriculum where there are other subject demands. Staff meetings were used for this. A further point that arose during interview was that coordinators can build on the scheme of work and knowledge level with individual teachers more effectively when there is less change in staffing. This was evident through comparison between the two primary schools involved where changes in two members of staff who had been trained had an impact. The ability to organise cover was also regarded as essential. If a school is vulnerable then an impact is greater if something goes wrong.

It was also noted that there was a lot of money investigated in ICT with an ongoing cycle of equipment renewal and replacement each year. In one primary school, every child had a device which was taken home every night. After 3 years it was often necessary to write off and sell equipment for a minimal amount. Looking to the future, it was also noted by the executive head that '...developments are constantly changing with a need for a real mixed economy of personal devices and devices that can be used collaboratively'.

Overall, then, the impact of the Project took a variety of forms. Reflecting on the theory of change originally set out for the Project (Appendix 1) there is a basis for arguing that the prognosis regarding the long-term goals is favourable. There is evidence for better teaching, improved pupil attainment and sustained effects that not only permeate the schools involved but also the wider school system generally. In terms of the contribution to the LSEF hypothesis and aims stated below, the investment in the Project, although relatively small in monetary terms, appears to have had pay-offs in a variety of way that in addition to pedagogy and attainment also connect with subject participation and aspiration. Computer science, programming, and digital devices these days are pervasive and when it comes to aligning the findings with the LSEF meta-evaluation themes, the Project can be said to span the focus on stretch in primary schools, work across the Key Stage 2 and Key Stage 3 phases as well as penetrating the focus on stretch in secondary schools.

The London Schools Excellence Fund (LSEF) is based on the hypothesis 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.

The aims of the Fund:
I. Cultivate teaching excellence through investment in teaching and teachers so that attention is re-focused on knowledge-led teaching and curriculum.
II. Support self-sustaining school-to-school and peer-led activity, plus the creation of new resources and support for teachers, to raise achievement in priority subjects in primary and secondary schools (English, mathematics, biology, chemistry, computer science, physics, history, geography, languages).
III. Support 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. In the longer term, create cultural change and raise expectations in the London school system, so that London is acknowledged as a centre of teaching excellence and its state schools are among the best in the world.

10. *Value for Money*

A value for money assessment considers whether the project has brought about benefits at a reasonable cost. Section 5 brings together the information on cost of delivery which will be used in this section.

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	12 days = 9%	In kind
Teacher CPD (face to face/online etc)	24 days = 17%	£23,550
Events/Networks for Teachers	4 days = 3%	In kind
Teacher 1:1 support (with pupils)	32 days = 28%	£15,700
Events/Networks for Pupils		
Staff costs (salaries and on-costs)	12 days = 9%	£11,100
Participant costs	1 day = 1%	£3,180

Evaluation costs	40 days = 26%	£4,500
Management and administration costs	10 days = 7%	£6,910
Others as Required – Please detail in full		
TOTAL	100% (135 days)	£64,940

Please provide some commentary reflecting on the balance of activity and costs incurred: Would more or less of some aspects have been better?

The teacher CPD and teacher 1:1 support with a class of pupils accounted for most of the costs in terms of time and finance. In conjunction with this there was a significant time investment generating and disseminating materials and resources together with the lesson plans involved. A notional four days allocation that the trainers understood that they had for this less visible aspect of the work was regarded as insufficient for planning and producing materials for the teaching units which were neither part of an established curriculum nor drew on a readily available body of material resources. Evaluation required visits to schools to carry out observations and interviews, as well as meetings with the trainers and personnel connected with LSEF funding. To fulfil the requirements regarding the extent and detail of the evaluation of the original and extended form of the project, time over and above that commensurable with the funding allocation was needed. Although management and administration costs may not have departed significantly beyond those anticipated, the number of rearrangements made as a result of the many varied and unpredictable circumstances that arose (which are a frequent feature when such enterprises have to be included within the school day) made demands on administrators' time.

10.2 Commentary of value for money

Please provide some commentary reflecting on the project's overall cost based on the extent to which aims/objectives and targets were met. If possible, draw on insight into similar programmes to comment on whether the programme delivers better or worse value for money than alternatives.

The outputs of the Project were the training, development of resources, lessons delivered by each teacher with trainer support, a half-day review, a conference, and a two-day workshop. These all contributed to the gains in knowledge and teaching performance of the identified teachers as well as to other teachers within the Borough of Lewisham and across London, and, the knowledge and performance gained by two classes of pupils in all the year groups from Year 1 to Year 7. Although the gains by teachers and pupils were not always uniform, if they were attributable to the Project activities then these can be said to relate to what was forecast in relation to the costs. Benefits in knowledge, understanding and pedagogical skills were broadly in line with expectation but in the more isolated instances where teachers were starting from a very low baseline and did not show aptitude there was some variance and limitations. Any claims regarding the underlying reasons for this particular outcome are beyond the scope of the evaluation but factors such as aptitude, confidence and competing demands could have had a bearing on this.

Comparing the unit costs with those associated with similar activities is not straightforward as it is not easy to make direct comparisons regarding value for money for this kind of project. As noted, this is a project with a wide compass that was carried out under a relatively small budget. It has largely met its original aims and targets and in that sense can be regarded as having value for money.

10.3 Value for money calculations n/a

Note: This section is only required for projects with control or comparison groups

In order to demonstrate the cost effectiveness of the project we would like those projects who had control or comparison groups to provide some value for money calculations. Further guidance will be issued to support projects with this.

n/a

11. Reflection on project delivery

Please include reflection on the following:

11.1 Key Enablers and Barriers to Achievement

- *Were there internal and/or external factors which appear to have had an effect on project success, and how were these responded to (if applicable)?*

Supportive senior management was regarded as a key enabler in the running of the Project. In addition to the executive head of the two participating primary schools instigating the Project in the first place, a sustained interest and support in the running of the project was evident throughout. This was consistent with the executive head's remarks during an interview that involvement at the level of senior headship is 'crucial' in the success of such an enterprise. Expanding on this theme it was noted that the role of the executive head was one of taking initiatives, not necessarily as an expert in computing, but to be aware of the implications and support accordingly. Although the class teacher has a direct responsibility for the achievement of each child, it was pointed out in the interview that leadership takes place at all levels. With reference to the role of the ICT coordinators in each of the schools, monitoring what actually takes place was seen as important; the ICT coordinator should have an overview of the entire curriculum throughout the age-ranges and expectations should be set so that children have their entitlement. It was also noted during the interview that the ICT coordinators should have time to work together and with the Project trainers regarding the curriculum, auditing, action plans and monitoring. When asked about potential obstacles to progress that teachers make with programming, time was seen as the biggest. With a completely new curriculum every subject requires time; for example, all staff meeting had been booked for curriculum-related work.

When assessing the barriers to achievement, it should be noted that schools are almost unique in the wide range of responsibilities they have to meet as institutions. In addition to enabling children to develop in their maturity as individuals and learners, and achieve in a variety of fields, they have to attend to the pastoral needs and moral welfare of those with very different backgrounds, home support, interests, abilities and ages, some of which are evident from the data on pupil sub-groups presented in Section 7. Inevitably this gives rise to a range of unpredictable demands made upon schools and the wide range of needs and situations they have to respond to. In particular, cover has to be organised and if a school is vulnerable regarding staffing resources the impact upon the achievement of any project is greater. One manifestation of this is that both the training sessions for teachers and the support work with the trainer, teachers and pupils required rescheduling. Challenges were evident when aiming to support collaboration between the Key Stage 2 and Key Stage 3 teachers from different schools. One case arose when a half-day transition meeting did not take place due to the priority of examination coursework demands. In some cases cancellations and rescheduling disrupted the continuity of input and support and one of the secondary schools had difficulties in continuing support as planned. In particular, this affected Year 6 to Year 7 transition meetings that would have taken place with teachers from the different schools and difficulties in rescheduling, taking into account the timing of new academic year and staff continuity, led to the inclusion of an additional participating secondary school for the purposes of the Project.

With regard to achievement within the Project, it was found that time was needed for teachers to acquire the knowledge and skills to the extent that they can apply these in practice autonomously. For example, the planned one-day face to face workshop with teachers to review and modify the unit and explore ideas for cross-curricular application did not occur because the three days allocated within the Project were needed for teachers themselves to reach a sufficient level of knowledge before this could be carried out. In the end, the review took place after school in twilight sessions.

The time it takes to acquire knowledge and skills had consequences for teachers who were intended to provide model lessons over two days with in-class support from trainer. Because the teachers were at a relatively early stage in developing their own skills and it was considered not appropriate for them to provide model lessons at that time and more appropriate to take a team teaching approach with modelling of lessons by trainer. This in turn threw more emphasis on the role of the Borough-wide conference and the two-day London-wide workshop held later on in the project to be used as a basis for modelling lessons such on how to teach computer programming concepts through unplugged activities and Scratch.

Another issue concerns the differing level of demands in subject knowledge needed at different key stags in areas such a programming. This affected Year 7 teachers as well Year 7 pupils who did not show readiness to start programming in the text-base language Python and instead a modified version of a Year 5 unit based on the more visually oriented language Scratch was deployed.

It was noted earlier that staff changes presented another issue. For example, there was a repeat of the Year 5 and Year 6 training carried out in the original project because the participating teachers in one of the primary schools left their employment. In the words of the executive head of teh two primary schools, ‘the knowledge level of individual teachers is stronger at one school because of less change; in the other school only two of the 6 original participating teachers have remained over the time-course of the Project.

Other enablers and barriers were also summarised by a primary school head teacher during interview: ‘Some teachers are naturally more confident than others, older teachers can be less secure, younger teachers not a problem. Resources help; hardware, software and Wi-Fi. More capacity is needed in the case of the latter, all children have their own iPads and continuity in teachers is important; this exists in one primary school because there are no new teachers, but this is not the case with the other primary school.’

The Project allowed collaboration between schools. This was also noted by the head teacher of one of the participating primary schools as an important feature because both participating primary schools were one-form entry and so teachers did not normally have easy access to year-group partners. By going to each others’ schools the teachers had a chance to get to know each other. The extent of Key Stage 2 and Key Stage 3 collaboration was enhanced through exchange meetings that took place at lunchtimes between Year 6 and Year 7 teachers.

11.2 Management and Delivery Processes

- *How effective were the management and delivery processes used?*
- *Were there any innovative delivery mechanisms and what was the effect of those?*

Delivery processes, although subject to change in the light of necessary rescheduling and teacher readiness in the light of new knowledge demands, were effective in that the quota of training and support sessions took place. The trainers were able to identify teachers' and pupils' needs rapidly and respond accordingly. At primary level in particular, the training took place in an environment where communication and support at different levels of management enabled this.

Training mechanisms were innovative in that the Computing Curriculum was interpreted in ways that retained a clear focus on the fundamental principles of computer science without these becoming masked at every stage of the pupils' and teachers' learning journey by details imposed by the requirements of specific hardware and software technologies. A good illustration of this was the use of 'unplugged activities' carried out away from any digital devices and where pupils could learn to create, communicate and carry out precise instructions interactively. This skill as transferred effectively into the learning and application of specific programming languages. Other innovative features were evident in the Project extension. These included the use of recent versions technologies (such a Cubetto) aimed at young people and adapted with suitable materials for pupils ranging from the early years. It was also noted that a dialogue occurred between the manufacturers of Cubetto so that pedagogical developments occurring with the Project could be fed back with the result that changes were made in the hardware and the support materials that were manufactured. A key innovative feature was the way that programming and computer science activities were embedded across the school curriculum. Although cross-curricular activity in itself is not new, it was the way that new software, digital devices and the related components were included in the areas of science, design and technology and music that marked the Project's distinctive contribution.

11.3 Future Sustainability and Forward Planning

- *Do you have any plans for the future sustainability of your projects?*
- *What factors or elements are essential for the sustainability of your project?*
- *How have you/will you share your project knowledge and resources?*

There are no specific plans for the future sustainability of the project as far as the trainers are concerned because of the nature of the resourcing framework. However, there is a clear commitment on behalf of the participating schools to continue to use the materials, resources and methods used, with one primary school regarding itself as a centre of excellence and locus of support for other schools through a network of support. Future sustainability was expressed in a variety of ways; in addition to the availability of materials online (such as the Computing At School website), there were activities such as the 'Coding Club' for children in Years 5 and 6. As one Year 3 teacher and primary ICT coordinator put it '...they really loved it ... it was great running the coding club with the trainer, helps confidence and I aim to run it myself. I also want to bone up on Year 6 activities'. It was also noted that the executive head saw a focus on the ICT coordinators and giving them time to work together and with the trainer on the curriculum, auditing and action plans, monitoring.

12. Final Report Conclusion

Please provide key conclusions regarding your findings and any lessons learnt

Alongside overarching key conclusions, headings for this section should include:

Key findings for assessment of project impact

- *What outcomes does the evaluation suggest were achieved?*
- *What outcomes, if any, does the evaluation suggest were not achieved or partly achieved?*
- *What outcomes, if any, is there too little evidence to state whether they were achieved or not?*

Key lessons learnt for assessment of project delivery

- *What activities/approaches worked well?*
- *What activities/approaches worked less well?*
- *What difficulties were encountered in delivery and how could they be mitigated in the future?*
- *Were there any additional or unintended benefits (e.g. increases in student attendance as a result of an intervention aimed at teachers)?*

Informing future delivery

- *What should the project have done more of?*
- *What should the project have done less of?*
- *What recommendations would you have for other projects regarding scaling up and/ or replicating your project?*

This Project set out with the aim of offering training to increase Key Stage 1 to Key Stage 3 teachers' computer programming knowledge, pedagogical skills and confidence to deliver the new Computing Curriculum. In turn the aim was to increase pupil achievement in computing. This would be achieved through a training programme where tailor made resources would be produced for each unit of work for pupils spanning Years 1 to 7 and would initially comprise two days of face-to-face training of teachers who would model how each unit can be taught with the teachers having the opportunity to experience learning from the pupil's perspective. The units of work would then be delivered by the teacher over two days with in-class support from trainer. These main aims were achieved insofar that the above interventions were completed for all teachers and their groups of pupils in all of the schools and the difference between pre- and post-test scores used as part of the evaluation for this Project has been taken, at least partly, to suggest a measure of impact of the project that has been in line with the anticipated outcomes.

For most of the teachers the intervention sessions took place over a relative short time period so that they were moved quickly into a 'zone' whereby accomplishments in programming were apparent and this was also reflected in the gains in confidence and self efficacy that the teachers reported in pre- and post-questionnaires. However, although the broad aim regarding identified teachers having increased subject specific knowledge and greater awareness of subject-specific teaching methods for computing was met, it was also evident that continued support and modelling was needed for the teachers throughout the sessions in delivering and assessing computing learning units with pupils. In other words, while theoretical accomplishments can be achieved relatively quickly, their counterparts in terms of classroom delivery often lagged behind.

There were, however, some departures from what was anticipated that related both to the nature of the outcomes and the way in which they were achieved. Contrary to expectation, it was found that the Year 7 teachers were not able within the time-frame available to meet the demands necessary for programming at a level commensurable with the teaching of their year-groups. This was also reflected in their pupils' familiarity with programming and readiness to progress. One manifestation of this was the demands in knowledge and understanding necessary for work with computer languages such as Python which were regarded as more text-based in comparison to languages such as Scratch that were regarded as 'visually oriented' and more accessible. As a consequence, modifications in both the training content for the teachers and what was taught to the pupils were made. With regard to the way that outcomes were achieved, the challenges of classroom delivery meant that the delivery a unit by a teacher over two days with in-class support from trainer did not take place as intended. In the event, the best approximation to this that was achieved was team teaching with modelling of lessons by the trainer. A further departure was that the one-day face-to-face workshop to review and modify the unit and explore cross-curricular ideas did not occur as planned. This was because an additional day was needed for the teachers to gain an appropriate level of knowledge and understanding of programming the review took place after school in twilight sessions. Similarly, support of collaboration between Key Stage 2 and 3 teachers to be achieved through Project group meetings and the delivery of a transition activity did not occur because of the revised content delivery resulting from the lack of teacher readiness as well as being displaced by other school priorities and instead exchange meetings between Year 6 and 7 teachers took place at lunchtimes. The aim to support teachers to develop activities that are fun and foster pupil creativity, reasoning and problem solving also proved too ambitious in that the trainers played a much greater role in this than intended.

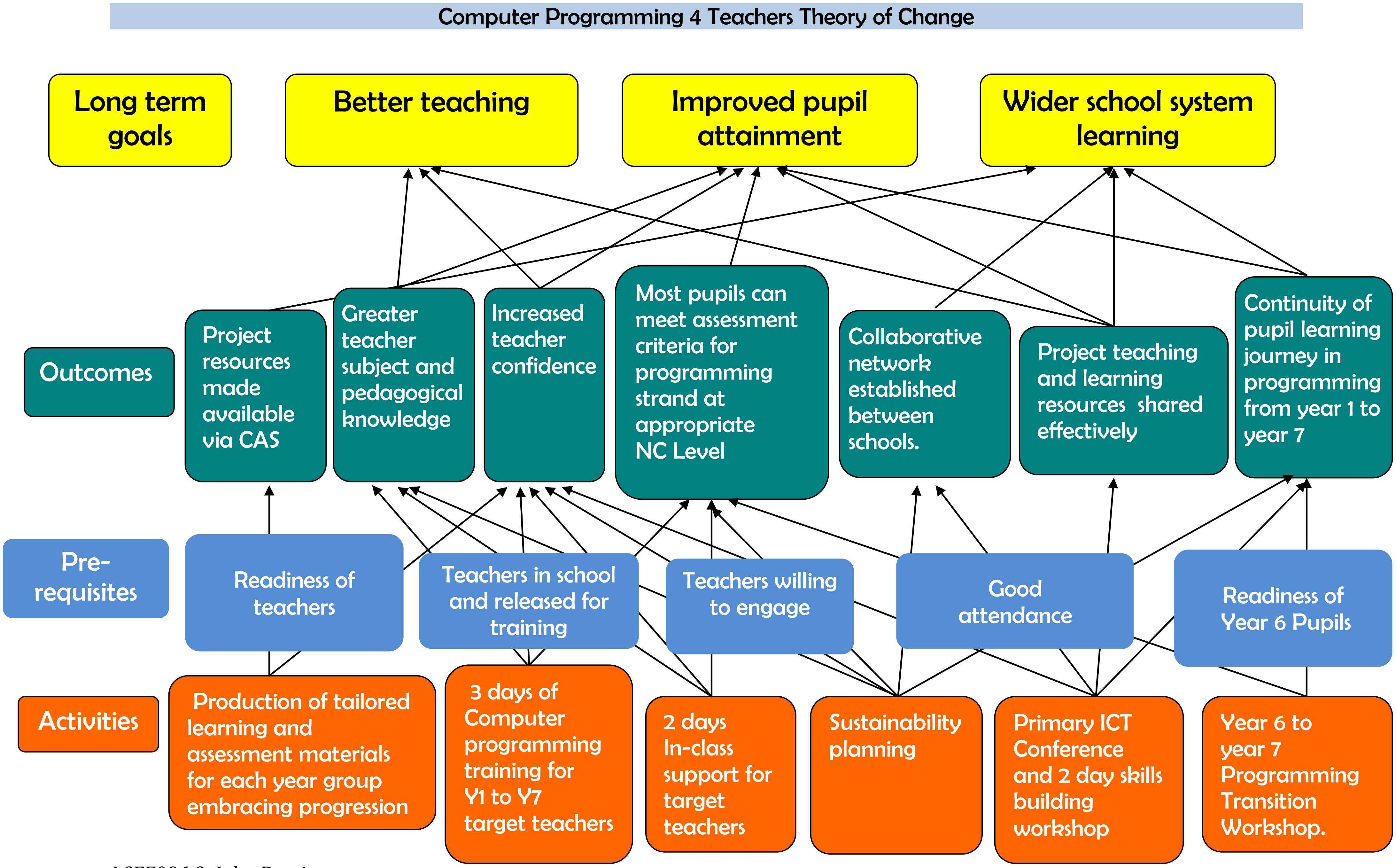
Aims relating to the wider school and system outcomes, dissemination and sustainability of the Project were achieved with a half-day school review being well-attended with positive feedback from participants, as were the borough-wide conference and two-day workshop for teachers. The online availability of teaching resources occurred during the period as intended and other outcomes included a school ICT audit becoming part of the school development plan. OR ...

Other achievements arising from the project that can be mentioned at this stage include a collection of quality training materials appropriate to each year group that can be used in teaching the National Curriculum Computing Programmes of Study from Key Stages 1 to 3. Similarly, with regard to the wider school system, through a one-day primary conference held in one of the participating schools in June 2014 the benefitted teachers were able to provide models drawn from their practice for teachers from the Borough (24 teachers from 13 schools) to observe. A two-day workshop drawing on materials and teaching strategies developed through the project was also held in July 2014 and attended by 30 teachers from 20 schools in boroughs spanning Greater London. From the feedback questionnaires, the primary conference and the July workshop were both well received. Overall, the project has achieved as expected so far.

With regard to activities and approaches that took place in training and work with pupils, it was found that that key principles in programming can be introduced with great effect away from the computer. These 'unplugged activities' were also regarded as 'really good for maths, for shape, design and collaboration' (Year 3 teacher, School 1), and for 'lateral thinking and problem-solving skills' (Year 3 teacher, School 2). Further insights into inducting children successfully into programming with digital devices emerged from the Project extension where it was found that it was important that children have the means to reflect on the sequence of commands they create remaining visible, as with Cubetto. The Project extension also addressed issues less often voiced such as programming is not an entirely abstract phenomenon and does not occur in isolation from other activities. The project extension the benefits of linking programming to other curriculum areas such as science, music and design and technology an well as giving pupils insight into how some digital components such as a keyboard worked.

In regard to professional development, teachers may have little or no subject knowledge as one Year 7 teacher pointed out ‘We were starting from scratch’. It was also noted in remarks by participating ICT coordinators that ‘Two teachers who started this year had no training in programming and no subject knowledge, so I will go in and deliver some lessons alongside them.’; ‘The Year 1 teacher is still a bit wobbly so I’m doing a bit more step by step with her.’ Although the teachers gained in terms of knowledge and skills it needs to be recognised that it takes time to learn. Although the findings from the Project suggest that teachers’ subject knowledge more than confidence or sense of self efficacy is likely to have an impact on pupil progress the fact remains that there are some teachers who need to be given courage and confidence to engage with programming themselves in the first place. Perhaps one illustration of this arose during an interview with a teacher who might otherwise have avoided programming if it was not for the sensitive handling by the trainer concerned. When asked if there was one important thing that you feel that you got from the course and wanted to pass on to another teacher then what would that be? the response was ‘Never to be scared of computing’. How training is carried out at a person-to-person level, then, is also a potentially important factor. As one Year 5 teacher remarked ‘...the trainer never made me feel bad, it depends how the person helps you’.

If any of the lessons learnt are to be translated into a form to be shared with other schools, then one consequence is that senior managers, who can play an important enabling role, may need to be aware that for effective classroom practice an intensive two- or three-day course in the teaching of computer programming on its own may also need to be followed by shorter support sessions in planning and reviewing in the classroom context that are distributed over a longer period of time. Moreover, because both teachers and pupils are starting from a relatively low knowledge- and experience-base with regard to programming, as opposed to ICT, this amounts to the insertion of a new subject domain within what were the earlier ICT Programmes of Study. For example, from the work at secondary level, it was found that ICT specialists do not necessarily have a knowledge base in computing. The impact in terms of effective classroom delivery resulting from an intensive course in programming could therefore be less than that expected in comparison to the earlier conception of ICT and to other more established subject areas such as maths and literacy where there is a greater shared capital of experience and know-how.



Computer Programming 4 Teachers Theory of Change
Long term goals
Better teaching
Improved pupil attainment
Wider school system learning
Outcomes
Project resources made available via CAS
Greater teacher subject and pedagogical knowledge
Increased teacher confidence
Most pupils can meet assessment criteria for programming strand at appropriate NC Level
Collaborative network established between schools.
Project teaching and learning resources shared effectively
Continuity of pupil learning journey in programming from year 1 to year 7
Pre-requisites
Readiness of teachers
Teachers in school and released for training
Teachers willing to engage
Good attendance
Readiness of Year 6 Pupils
Activities
Production of tailored learning and assessment materials for each year group embracing progression
3 days of Computer programming training for Y1 to Y7 target teachers
2 days In-class support for target teachers
Sustainability planning
Primary ICT Conference and 2 day skills building workshop
Year 6 to year 7 Programming Transition Workshop.

Appendix 2

Evaluation Framework: Programming for Teachers

Outputs	Indicators of Outputs	Evidence of Outputs	Impact data collected
Training (3 days per year group) in computing skills and pedagogy targeted for 14 teachers (one from each year group in two primary schools; two Y7 teachers from two secondary schools).	Teacher attendance and participation.	Registers taken and completed questionnaires. Qualitative feedback from interview data.	Analysis of registers and questionnaires, qualitative feedback from interview data.
Lessons delivered by each teacher with trainer support.	Teacher and pupil attendance and participation.	Pupil work and completed pre- and post-intervention test results (details below).	Analysis of registers and test results.
Tailor made resources and assessment frameworks.	Availability of resources.	Collation of developed materials including scheme of work.	Effective use of tailor made resources in the classroom.
Half-day within-project review for primary, one-day primary conference for Lewisham teachers, two-day workshop for London-wide schools on programming.	Delivery of CPD for the intervention identified teachers. Delivery of the half-day within-project review, one-day primary conference, two-day workshop for London-wide schoolson programming.	Registers taken and evaluation questionnaires.	Analysis of registers and evaluation questionnaires.
Collaborative network established between schools.	Teachers from different schools exchange knowledge and resources.	Meetings and other communications and resources passed between teachers.	Qualitative feedback and interview data.
Fourteen teachers as digital leaders created in three schools.	Designated teachers impart knowledge, skills and resources.	Teachers' presentations at the half-day school review and Primary Conference. Observations and qualitative feedback frim Interviews.	Qualitative feedback and interview data. Analysis of evaluation questionnaires.

Project extension	*Production of teaching and assessment resources.* *Reception and Year 1: training and classroom delivery of Cubetto Play Set so that teachers can enable children to learn basic programming logic through a tactile learning interface.* *Year 4: Training and classroom delivery of Electricity and Circuits Unit (Electro dough and Makey Makey).* *Year 6: Training and classroom delivery of Robotics and Coding Unit. The children build and code Cubetto Robot.*	*Teacher attendance and participation.* *Reception and Year 1: Three half-days of classroom support.* *Years 4 and 6:Three days equivalent of classroom support.*	*Registers taken and completed questionnaires.*	*Analysis of registers and evaluation questionnaires and structured interviews. Observation of teaching activities including video to capture teacher and pupil experience.*

	Outcomes	**Indicators of Outcomes**	**Baseline data**	**Impact data**
Teacher outcomes	Greater knowledge of key programming concepts and ability to apply these in problem solving and creative activity, and the associated pedagogical knowledge of computer programming.	Higher scores in teacher test - self developed, written and practical items on knowledge, skills and reasoning in computing, reviewed by the external evaluator at Goldsmiths University. Higher scores on a teacher self efficacy scale adapted from Megan Tschannen-Moran, Ohio State University and supplied by LSEF organisers.	Scores collected from pre-intervention subject knowledge test (written and practical) for each participating teacher. Data collected during the Autumn 2013 and Spring 2014 school terms (see Sheet 2 for details). Scores obtained from a self-rated self efficacy 9 point scale administered prior to intervention. Data collected during the Autumn 2013 and Spring and Summer 2014 school terms (see Sheet 2 for details).	Difference between teacher pre- and post-intervention test scores (written and practical). Data collected during the Autumn 2013 and Spring 2014 school terms (see Sheet 2 for details). Scores obtained from the same self-rated self efficacy scale used pre-intervention and administered post intervention. Data collected during the Autumn 2013 and Spring 2014 school terms (see Sheet 2 for details).
	Increased teacher confidence in teaching the programming element of the new Computing National Curriculum and ability to support peers in delivering and assessing this.	Increase in teacher scores on confidence scale items in a questionnaire administered before and after the intervention. The questionnaire included items on the new curriculum and associated skills. This was self-designed and then reviewed by the external evaluator at Goldsmiths University.	Levels of confidence indicated by self-rating scores on 5 point scale items in the pre-intervention questionnaire to be completed by each participating teacher. This to be supported by data from structured interviews carried out with teachers from each key stage and observation of classroom activities. Data collected during the Autumn 2013 and Spring and Summer 2014 school terms (see Sheet 2 for details).	Difference in scores collected from post-intervention questionnaire (self-rating 5 point scales as with the pre-intervention questionnaire) and qualitative data from observations and structured interviews with individual teachers. Data collected during the Autumn 2013 and Spring 2014 school terms (see Sheet 2 for details).

	Access to high quality training materials.	Availability of tailor made resources to suit profile of pupils and to promote effective teaching of programming.	Evidence of the distribution and use of training materials.	Evidence of effective use of tailor made resources by teachers during the training sessions. (See Sheet 2 for dates of sessions.) Difference between teacher pre- and post-intervention test scores (written and practical) as above. Data collected during the Autumn 2013 and Spring 2014 school terms (see Sheet 2 for details). Analysis of qualitative feedback and other interview data.
	Understanding of the progression in skills in the computing curriculum and the learning journey pupils will take.	Higher level of subject knowledge that extends beyond a single year group which a teacher is responsible. For Year 6 and 7 teachers this will also include understanding of text-based languages as well as more visually oriented languages.	Scores collected from pre-intervention subject knowledge test (written and practical) for each participating teacher.	Higher post-test scores and methods of working observed during activities involving pupils. Evidence for pedagogical strategies that provide sound knowledge of computing concepts that span more than one year-group (e.g., algorothms, variables, operators, selection, user input). For Year 6 and 7 teachers to allow an unimpeded focus on the correct use of syntax and understanding data types for the above.
Project extension	*Acquisition of teacher subject knowledge and pedagogical ability and confidence relating to the exploratory programming activities for the project extension listed above. For Reception and Year 1, developing pedagogical strategies using newly developed commercial hardware resources. Development of materials and assessment framework. For Years 4 and 6, integration of computing into a topic approach within the school curriculum and the development of electronics and music activities linked to programming.*	*Pupil attainment indicated through learning outcomes met or exceeded by most of each class.*	*Teacher attendance register. For Year 4 and Year 6 teachers the test and questionnaire data from the initial project.*	*Evidence of knowledge and confidence gained from an extension test and questionnaire with 4 point confidence scales and self developed, written items on knowledge, skills and reasoning irelating to the output units listed above. Additional evidence from interviews, qualitative feedback and video recordings of activities. The test and questionnaire were reviewed by the external evaluator at Goldsmiths University.* *Data collected during the Summer 2015 school term (see Sheet 2 for details).*

Pupil outcomes	Pupils make progress in meeting NC assesment criteria for computer programming and algorithms appropriate for their age	Pupil test with self developed written and practical items on knowledge, skills and reasoning in computing, reviewed by the external evaluator at Goldsmiths University. Practical element of test relates age-related NC Standards. Practical is teacher-assessed incorporating pupil self-assessments.	Scores from pupil test (age-appropriate written and practical) administered prior to intervention. Data collected during the Autumn 2013 and Spring 2014 school terms (see Sheet 2 for details).	Difference between pupil pre- and post-intervention test scores (age-appropriate written and practical). (The same test to be administered after discussion with and advice from Rocket Science acknowledging Computing as a new subject on the school curriculum.)
	Effective transition and progression from visual to text-based computer programming for pupils in transition from Year 6 to Year 7 to meet requirments of the new Computing Curriculum.	Year 6 pupils performing at Level 5 in computer programming using a text-based language (Python).	Scores from Year 6 pupil post-intervention tests (written and practical). These relate to the pre-requisite knowledge and skills necessary to progress effectively from visual to text-based programming. Tests are self developed, written and practical items on knowledge, skills and reasoning in computing, reviewed by the external evaluator at Goldsmiths University. Data collected during the Summer term 2014 (Year 6 Scratch) (see Sheet 2 for details).	Evidence from pupils tests (detailed above) for the pre-requisite knowledge and skills necessary to progress effectively from visual to text-based programming. Evidence of pedagogical strategies (from external evaluator observation andinterview with trainer and Years 6 and 7 teachers) that provide sound knowledge of computing concepts (e.g., algorothms, variables, operators, selection, user input) to allow an unimpeded focus on the correct use of syntax and understanding data types for the above. For Year 6 and 7 teachers this includes an understanding of text- as well as visuallly-based languages and an awareness of the related pedagogies. Readiness and capability of pupils available from lesson observation, interviews and work produced.
	Opportunities for pupils to consider a greater range of career paths related to computer science.	Pupils ask questions and discuss career paths in computer science.	Opportunities for pupils to express an interest in learning as a career path.	Qualitative feedback from observations and interview data suggesting that pupils are interestd in computing as a career path.

Project extension	*Pupil attainment and learning outcomes related to the outputs for the project extension listed above.*	*Scores obtained on self developed pupil 'I can' statements validated by trainer. Scores obtainedon assessed pupil activities validated by trainer. Quality of written content in pupilworkbook. All of the above self-designed and then reviewed by the external evaluator at Goldsmiths University.*	*For Year 4 and Year 6 pupils the data from the same cohorts of children in their previous school year obtained in the initial project were grouped into three categories, namely: Emerging, Ready to Progress and Exceeding.*	*Learning outcomes met according to: scores obtained on self developed pupil 'I can' statements validated by trainer; scores obtainedon assessed pupil activities validated by trainer; quality of written content in pupilworkbook. Data collected during the Summer 2015 school term (see Sheet 2 for details).*
Wider school outcomes	Teachers outside the intervention group have access to exemplars of good practice and better resources aimed at increasing knowledge and understanding of the new National Curriculum requirements in Computing and confidence when teaching.	1) Attendance at Borough of Lewisham Primary Conference 2) Positive review of conference from post-conference questionnaire. 3) Attendance at two-day London-wide workshop on KS2/3 programming with Scratch. 4) Positive review of two-day workshop from post-workshop questionnaire.	1) Scores collected from pre-conference questionnaire. Self-rated 5 point scale items relating to understanding requirements of the new Computing National Curriculum, confidence when teaching computer programming). 2) Scores collected from pre-workshop questionnaire (self-rated 5 point scale items include: knowledge of the new Computing National Curriculum, confidence when teaching computer programming).	1) Difference in scores collected from pre- and post-conference questionnaires. 2) Difference in scores collected form pre- and post-workshop questionnaire (additional items in post-conference questionnaire include: usefulness of workshop topics, likely take-up of exemplar resources, improved subject knowledge). 3) Number of teaching packs issued. 4) Attendee list
	Partner schools become 'Centres of Excellence' who promote computing and support other schools in the delivery of a rigorous curriculum.	Attendance at Borough of Lewisham Primary Conference Positive review of conference from post-conference questionnaire.	Scores collected from pre-conference questionnaire. Self-rated 5 point scale items relating to understanding requirements of the new Computing National Curriculum, confidence when teaching computer	Difference in scores collected from pre- and post-conference questionnaires. Number of teaching packs issued. Attendee list.

Appendix 3

LSEF 096 – St John Baptist Project Programming 4 Teachers

Catalogue of Teaching Resources made for the project

Year 4: We are digital music makers – Zali Collymore-Hussein		
Session	**Filename**	**Description**
Unit resources	Unit overview_Y4 We are digital music makers.pdf	Teacher's guide to unit
	Y4 digital music makers_self-assessment.docx	Pupil self assessment form – compilation of 'I can statements' for each of the 4 sessions
Session 1 Electrical circuits	Y4_session 1_teacher presentation.pptx	Teacher slides
	pupil workbook.pptx	Pupil workbook to accompany unit activities
Session 2 'Makey Makey' Circuits and GarageBand	Y4_session 2_teacher presentation.pptx	Teacher slides
	handouts 1 and 2.docx	Handout 1: music sheet for 'Hot Cross Buns' Handout 2: exercise to map keyboard keys to musical notes
	La Revolution Francaise 2011.pptx	PowerPoint presentation used with 'Makey Makey'
Session 3 'Makey Makey' Circuits and Scratch **Session 4** Scratch	Y4_session 3_teacher presentation.pptx	Teacher slides
	MM_Dub.sb2	DJ program
	MM_Dub- sprites and sounds folder	Assets for MM_Dub scratch program
	Y4_session 4_teacher presentation.pptx	Teacher slides
	1hot cross buns-starter.sb2 2hot cross buns-long.sb2 3hot cross buns-with loops.sb2 4hot cross buns-with loops.sb2	Programming 'hot cross buns' tune in Scratch, files at different production stages.

Year 5: We are game makers – Zali Collymore-Hussein		
Session	**Filename**	**Description**
Unit resources	Y5_unit overview_we are game developers.pdf	Teacher's guide to unit
	Y5_unit_student workbook.pptx	Pupil workbook to accompany unit activities
Session 1 Unplugged activities	Y5_session 1_teacher presentation.pptx	Teacher slides
	Chatbot links.docx Chatbot links.pdf	Hyperlinks to chatbot websites
Session 2 Introduction to Scratch	Y5_session 2_teacher presentation.pptx	Teacher slides
	Cat walking downhill Folder: 1cat walking downhill-starter.sb2 2cat walking downhill-positioning and moving.sb2 3cat walking downhill- repeat block.sb2 4cat walking downhill-finished.sb2	Teacher files to support demonstration
	Glide-Animate activity card.pptx	Crib sheet on how to program sprites to glide and animate
Session 3 Making games in Scratch	Y5_session 3_teacher presentation.pptx	Teacher slides
	tutorial_whack-a-bat.pdf whack-a-bat.sb2	Finished scratch program – this is the program that the children will be producing
	tutorial_hitHippo.pdf hit-a-hippo.sb2	Tutorial for children to create MM_Dub scratch program
Higher level games Scratch	archery.sb2 archeryBlank.sb2 Tutorial Archery Game.docx pacman.sb2	Examples of higher level games for higher achievers

Year 6: We are quiz makers – Zali Collymore-Hussein		
Session	**Filename**	**Description**
Unit resources	Y6_unit overview_we are quiz makers.pdf	Teacher's guide to unit
	Y6_student Quiz workbook.pptx	Pupil workbook to accompany unit activities
Session 1 Unplugged activities	Y6_session 1_teacher presentation.pptx	Teacher slides
	Tic-tac-toe Activity Folder • Intelligent paper_teacher instructions.docx • Intelligent paper_Os and Xs algorithm.pdf • noughts and crosses game_board.pdf • noughts and crosses game_statement bank.pdf • noughts and crosses grid.docx	Resources for playing tic-tac-toe activity to support understanding of algorithms and 'if else'
Session 2 Scratch 'broadcast block'	Scratch Challenge_boy walking.docx Scratch Challenge_boy walking.pdf	Storyboard for boy walking animation
	boy walking.sb2	Finished Scratch programme of 'Boy Walking'
Session 3 Cassy dancing	Y6_session 3_teacher presentation.pptx	Teacher slides
	Teacher Dance Folder • 1CassyDancing.sb2 • 2 CassyDancing.sb2 • 3 CassyDancing.sb2 • 4 CassyDancing_Finished.sb2	Files for teacher to use for modelling making Cassy Dancing programme
	Pupils Dance Folder • 1pupil_CassyDance_start.sb2 • 2pupil_CassyDance_DebugChallenge.sb2	Starter file for CassyDance program Debug challenge to correct errors in CassyDance program
Session 4 Quizzes	Y6_session 4_teacher presentation.pptx	Teacher slides
	Continent's Folder • Continents quiz.sb2 • Continents_pupilStarter.sb2 • Folder: continents maps	Finished version of Continents quiz Starter file for pupils continent quiz Folder containing maps of individual continents
	General Knowledge Quiz Folder • Gk quiz.sb2 • Gk quiz backdrops folder • Gk quiz tutorial	Finished version of general knowledge quiz Folder containing photos for quiz backdrops Tutorial on how to create general knowledge quiz

Year 6: Paper Circuits and Robots – Zalihe Collymore-Hussein

Session	Filename	Description
Unit resources	Y6c_unit overview_papercircuits and robots.pdf	Teacher's guide to unit
	Y6c_paper circuits_self-assessment.docx	Pupil self assessment form – compilation of 'I can statements'
Session 1 Blinking robot	Y6c_session 1_teacher presentation.pptx	Teacher slides
	circuitDiagram_blinking robot.png	Pupil workbook to accompany unit activities
	preUnit_circuit quiz.docx	Short multiple choice test of electrical circuits
	robot posters folder	4 robot designs for paper circuit making
Session 2 Making challenge	Y6c_session 2_teacher presentation.pptx	Teacher slides
	GreetingCardChallenge_pupil workbook.pptx	Workbook to gather assessment evidence
	Greeting cards examples folder	Examples of paper circuit greeting cards
Session 3 Inputs and outputs	Y6c session 3_teacher presentation.pptx	Teacher slides
	Keyboard binary code.png	
	Y6c postUnit_circuit.quiz	PowerPoint presentation used with 'Makey Makey'

Year 6-7 transition: Introduction to Python – Zalihe Collymore-Hussein

Session	Filename	Description
Unit resources	Y6-7t_teacher presentation.pptx	Teacher slides
	Python basics_student workbook.pdf	Pupil self assessment form – compilation of 'I can statements'
	Python files folder	Python files for pupils and teacher