London Schools Excellence Fund

Self-Evaluation Toolkit
Final report for

London STEM Learning Enrichment Networks

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Project Oracle: Level 2
Report Submission Deadline: Round 2 - 30 September 2015
Report Submission: Final Report to the GLA

Project Name: London STEM Learning Enrichment Networks
London Schools Excellence Fund Round:
Author of the Self-Evaluation: Kathy Jowitt
Project Number: LSEFR1235v3
Total Approved LSEF funding for Project: £110,900 + £10,450 additional funding = £121,350.00
Total Lifetime Cost of the Project: £121,350.00 plus additional £134,000 (STEMNET match funding)
Actual Project Start Date: April 2014
Actual Project End Date: 30 September, with extension to sustain the project to 30 December 2015

1. Executive Summary

STEMNET have been supporting a small group of eight Lead Schools, with two groups of pupils, each in the first instance, with a roll out to forming networks of Lead and local Network Schools across London. The project concentrates on the delivery of Design & Technology (D&T) activities supported by STEM Ambassadors.

This initial phase allowed us to use outcomes and learnings - as the eight Lead Schools went on to work with their own Network of schools. The Network phase widened the reach of the project and the number of pupils impacted.

This report covers self-completion questionnaires and interviews with affected pupils, teachers and STEM Ambassadors before and after the STEM Ambassador assisted activities have been undertaken.

Pupils

Pupils' reactions to the activity were extremely positive. Over two thirds found the activity inspiring and said that it had made them think differently about D&T. No statistically significant changes were observed in pupils' enjoyment of the different stages of D&T activities as a result of the intervention. In part this may be because pupils already find most aspects of the activities enjoyable.

The practical elements of activities where students are physically involved in 'designing/making' are the most popular - both prior to and after the intervention, designing the product, making the product and working as a team.

Teachers

The number of teachers that were directly engaged the project totalled 50, 23 of these were from the Lead School stage and 27 from the Network School stage. This does not give a large base with which to demonstrate significant learning or change in behaviour, but we have been able to ascertain some very positive outcomes from the evaluation.

The quantitative findings showed that teachers felt that the project had overall been a success and that it had increased their confidence and felt that their pupils had been kept interested and engaged during the project.

The pre and post-project surveys of Network School teachers showed increases in average scores for Confidence in teaching and subject knowledge of D&T, confidence integrating people from the world of working into their teaching and their ability to talk to pupils about the use of D&T in careers.

Qualitative findings provided evidence of beneficial impacts. Teachers mentioned gaining greater understanding of how to use people from industry and academia in class resulting in more inspiration and motivation for their teaching; updating their knowledge of contemporary science and engineering; developing new resources that they will use again and share with colleagues; enjoying support from other teachers e.g. help with new curriculum, assessment of pupils' project work, sharing of resources and best practice and the added bonus of being able to use grant funds provided to buy new equipment and consumable materials.

Recommendations

One of the key elements to success rating was the offer of central training days for Lead teachers and the provision of a D&T consultant to advise and guide teachers through the potential benefits, changes and challenges of the new curriculum and what they need to think about and cater for in the future. Any future project should offer a timetable of such sessions, topics covered and key dates shared and committed to in advance.

In order to ensure sustainable communication between STEMNET and all Lead Schools at least two Lead teachers and someone from the school's Senior Leadership Team needed to be part of the programme in order that planning and work load could be shared and that the senior member could continue to support planning and freeing up time for activity to take place and training sessions and meeting to be attended.

Any programme like this need strong administration and support from the facilitator. This project only moved forward with some schools because of the level of support and administration that was taken away from schools.

Schools wanted some sort of recognition or certification for being part of the project, which again, might be something that the GLA grant awards could include.

STEM Ambassadors

For STEM Ambassadors the project was a rewarding and inspiring experience, motivating them to do further work with secondary schools. They greatly appreciated the opportunity to promote their field of work to pupils and teachers and to develop their communication skills.

2. Project Description

The aim of this project is to create innovative and sustainable networks, led by schools, to strengthen the teaching of design, technology and engineering. At a time when a new D&T curriculum is to be implemented, STEMNET's volunteer STEM Ambassadors have supported new classroom approaches and activities which aims to develop teacher knowledge, bring subjects to life with real-world contexts, increase attainment and encourage London's next generation of engineers, designers and technologists.

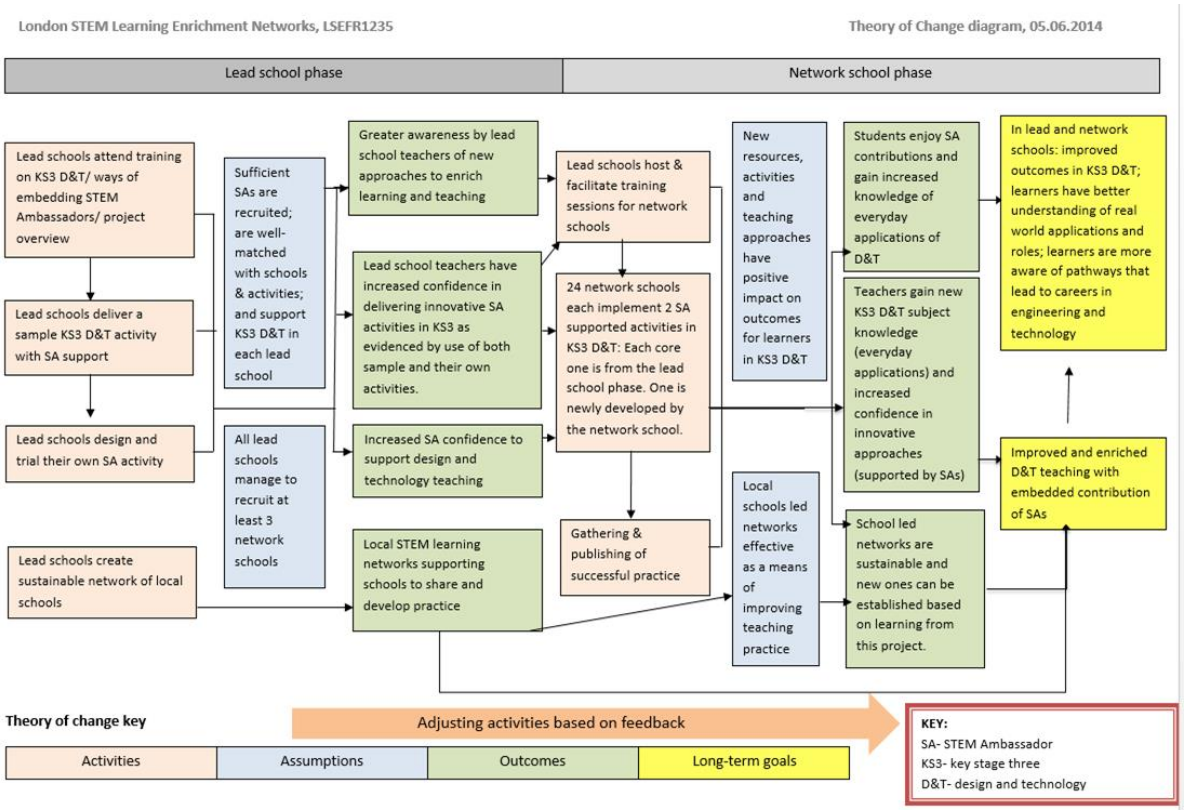
The project ran from April 2014 until 30 September 2015, with extension to sustain the project to 30 December 2015.

This project was divided into two key phases:

Phase 1: STEMNET formed and trained a network of eight Lead Schools across London, these schools then implemented sample STEM Ambassador D&T activities, followed by creating and delivering an activity of their own.

Phase 2: the eight Lead Schools were each to recruit three schools to create a local Network, and then train and support them to implement two activities in their own school, supported by STEM Ambassadors.

The aims of the project were to improve D&T teachers' subject knowledge and practice, through the contribution of STEM Ambassadors from the contexts listed in the National Curriculum, STEM Ambassadors who will bring first-hand experience of the impact of D&T in the wider world.



Dissemination was through school-led activity with an aim to create cultural change by improving learners' ambitions in STEM subjects; through increased interest, awareness and understanding that results from the contribution of local role models and contexts to teaching and learning. The project aimed to provide learning about effective school-led networks as a means of knowledge transfer and continuous professional development (CPD) for teachers.

Long term, the aim is to see STEM learning networks geographically spread across London. Lead Schools (with good levels of engagement in STEM subjects) were identified with a mixture of attainment levels (between 50 and 100%) along with those of socio–economic disadvantage. Focus areas were Walthamstow, Newham, Hillingdon, Hounslow, Haringey, Lewisham, Harrow and Bexleyheath.

On-going evaluation was embedded to ensure that the model and approach is refined on the basis of learning outcomes for students, teaching staff and STEM Ambassadors.

As aligned to Outcomes 5. and 6., STEMNET are intending to sustain the project until December 2015 (one additional term) to develop new resources delivered and conceived by the Network schools that didn't have the time to run and complete these during the original timeframe. Beyond this, the aim will also be to continue to support Lead and Network Schools in integrating the new curriculum, as needed, and continued Ambassador support in terms of the D&T teaching.

2.1. As aligned to Outcome 7, a set of eight exemplar activities were produced to support new aspects of the D&T curriculum and for participating schools to use as examples or stimulus for their STEM Ambassador assisted lesson/s. The outlines for these activities are given below (Fig 1). Teachers were then required to adapt the teaching principle and ideas given to best fit their

Design and Technology in School		*Possible STEM Ambassador*	
Aspect	***Learning***	***Background***	***Example Activities***
1. Working in contexts	Able to recognise opportunities and needs in setting including: domestic & local contexts, and industrial contexts	Manufacturer Designer Researcher Food nutritionist / technologist	Human observation Cultural needs, socio-economic needs Researching trends Identifying issues, needs & opportunities Identify technology leaps /causes
2. Key events and individuals in design and technology	Identify /understand timelines and drivers for change. Impact on individuals and society	Designer Manufacturer Food and technological historian	Identify technological & product leaps & causes Timeline in key sectors / industry, e.g. materials, style, production
3. Iterative design: "learning by completing"	Progressively reflecting on their understanding of the issues and ideas through action to develop their own solution	Designer Technician Inventor Architect Food marketing	Questioning strategies & Reflective techniques Peer review techniques User review techniques Client review techniques Experimentation e.g. Dyson / Food technologists
4. User-centred design:	Placing the users at the heart of the designing	Design researcher Designer Social researcher Food nutritionist / marketing department	Research methodology: Focus group activities Peer review techniques User review techniques Client review techniques Testing group questions / activities Client group review and feedback methodology
5. Mathematical Modelling	Using maths to model in parameters such as shape, space, scale, size, ratio, speed, cost, power, pressure, etc	Food or product manufacturing Production engineers Engineers: electrical, mechanical, systems Architect /Quantity surveyors Designers	Maths in food. BNF nutritional analysis Material quantities and costs Quantity/scaling in batch and mass production Mechanical systems e.g. wheels, gears and levers, distance, speed and force Electrical systems, power, voltage, current, resistance
6. Biomimicry:	Looking at how the natural world solves problems and using this **inspiration** to develop new ideas for the made world. The design and production of materials, structures and systems that are modelled on biological entities and processes.	Designers Engineers Architects Behavioural scientist Biologist / Chemists Physicists	Design + development of products, structures and systems. Ways of learning from natural forms and movement. Using natural world as a stimulus for shape + strength Examples of behavioural, biological and chemical studies leading to mimicry ideas
7. Cooking and nutrition within design and technology	Give children the practical skills and knowledge they need to feed themselves well for life. Where food comes from and what it can do for their bodies, thereby developing a lasting love of, and interest in, safe, hygienic good food.	Nutritionists – AFN Dieticians Food technologists Food researchers Human biologists Food production including farmers and agronomists Food processors and manufacturers Chefs Retailers Restaurant / café Management / front of house staff	Nutritional elements – data and trends. Where food comes from Food processing & manufacture Seasonality & preservation Biotechnology and bio-economy e.g. d GM foods Food safety & hygiene in production and cooking Home cooking and nutritional planning Cooking commercial / mass production,/ packaging and distribution
8. Programmable Components:	Taking advantage of the wide applications, new materials and electronics in resistant materials and textiles product	Electronics engineers Designers Manufacturers	Systems modelling Process modules (input / output / decision)

planning and students' ability.

Fig 1 exemplar activities

Once their two activities had been delivered and trialled with classes, teachers transferred the outcomes into the Template activity form provided. This format allowed teachers to share curriculum fit and relevance, learning outcomes, best practice and the role the STEM Ambassador played in the delivery of the activity. The Template activity sheet used is shown below (Fig 2).

Part of the output of this project is the production of a set of resources. This involved editing, designing and publishing D&T activities from the pool of Templates collected from Lead Schools and with the intention (through sustaining the project) a further set from Network Schools.

The aim is that these activities and resources assist schools with new teaching approaches to enable other schools and STEM Ambassadors to implement the STEM Ambassador activities and teaching approaches and to draw on London's design, technology and engineering heritage to enrich learning.

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London Schools Excellent Fund Sample STEM Ambassador Activity: *Title*

Your name and school:		
Curriculum content	*Brief details of the knowledge / skills being developed*	
Design and technology context	*The design and technology context in which the unit of work is located – include national curriculum links with knowledge and skills*	
	School / lesson(s)	*STEM Ambassador*
Key questions learning objectives	*What are the learning objectives for the unit of work and the STEM Ambassador supported activity?*	*Outline the contribution the STEM Ambassadors will make towards the overall learning objectives – this might be several sessions / roles in unit of work.*
Activities	*How the STEM Ambassador supported activity fits into the unit of work and what the teacher / school needs to do to support the STEM Ambassadors session(s)*	*How did the STEM Ambassador support the activity?* *For example:* *1. Introduce self and career* *2. Explain how experience or role is relevant to subject / topic; illustrate with short presentation; use photos or video clips; describe an example from industry.* *3. Share knowledge or demonstrate a skill (if applicable) e.g. a sketching technique*
Time	*Time for the overall unit of work (if not a stand-alone activity), and how this activity fits into it. For example, does the STEM Ambassador activity start a unit of work? Is it mid-way through – in which case what is already covered? (Let the Ambassador know in advance)*	*Time for the STEM Ambassador activity- this might be several sessions / activities in a unit of work*
What you need	*Outline the key resources needed for unit of work*	*Resources required for STEM Ambassador activity*
Teacher / STEM Ambassador hints		
Explanation	*Principles or key criteria for learning and strategy to be successfully used*	
Format	*Describe e.g: standalone and /or within a unit of work?*	
Who uses this idea / activity / skill	*Industry / career / STEM Ambassador profile*	
Resources attached	*Itemise any assets to be used with this* **activity e.g: example student work template/worksheets, factsheet, stimulus images, film), teacher and/or STEM Ambassador Notes**	

Fig 2 *Template activity Sheet*

As Aligned to Outcome 7, by the close of the summer term 2015, 11 resources were developed from the resources (Fig 3) shared by the eight Lead Schools (as linked to Outcome 1.)

Fig 3 *Sample activities*

The resources currently produced can be access here: https://db.stemnet.org.uk/resources/profile/id/442 the home page where the resources are shared as of September 2015 (– so early in the academic year) has been visited 190 times.

Again, as aligned to Outcome 7, and as part of our sustainability of the project we will be continuing to work with Network Schools to develop further materials and with the remainder of the match funding allotted, STEMNET will produce USB memory sticks holding all of the D&T resources and circulate a copy to the Head of D&T in all London schools.

The resources have been shared via our national network of local Contract Holders, across the UK; we have shared them with DATA and it is believed that the GLA will also incorporate them on an online platform.

3. Theory of Change and Evaluation Methodology

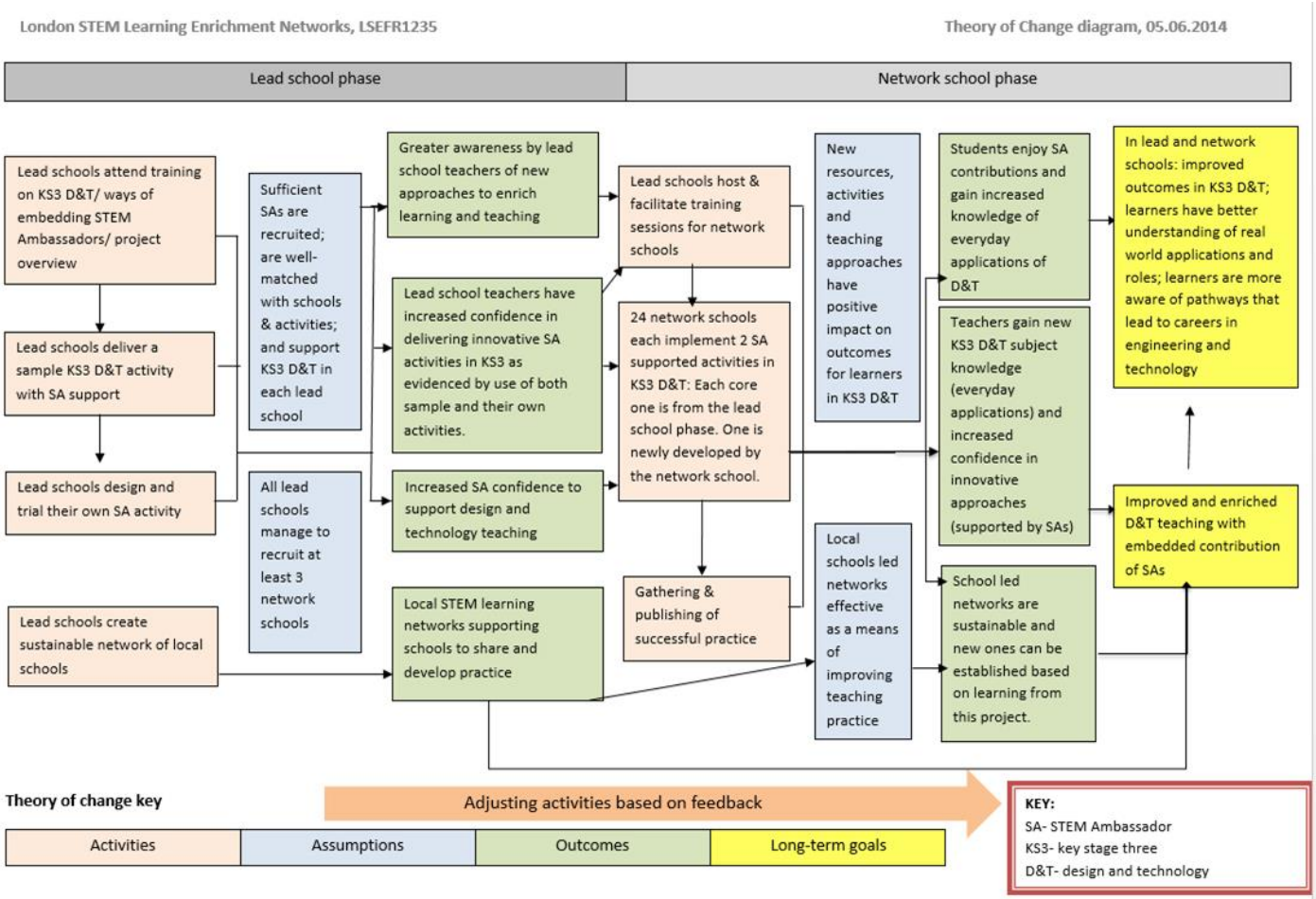


Fig 4 *Change and Evaluation Framework*.

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.

See **Fig 4** above for Theory of Change

Table 1- Outcomes

	Outcomes: Do NOT complete greyed-out boxes				
	Description	*Original Target Outcomes*	*Revised Target Outcomes*	*Actual Outcomes*	*Variance*
	Lead schools phase				
	Teachers				
1	Development of a set of 8 classroom STEM Ambassador activities/resources	Lead schools were to develop an activity each based on some template ideas developed by STEMNET and a DT advisor and with the support of STEM Ambassadors. Of the yield of activities, STEMNET were to develop 20 resources to share with a wider audience of D&T departments across London and nationally.	All eight Lead schools created template activities for STEMNET to develop. These activities were published on the STEMNET database of resources and links sent to stakeholder in July 2015.		
2	Training for lead school teachers on how project will work, and how they can work with STEM Ambassadors	A teacher from each school attended along with 8 STEM Ambassadors. All received an induction to the project and met a STEM Ambassador. D&T specialist Consultant presented the landscape on the new Curriculum took questions. Feedback given from all attendees was very positive and Lead teachers left to work on their project/action plan.	We didn't achieve 2 teachers for each school, the main reason given was due to the timing - ½ term before public examinations. We requested that each school provides contact details for at least 2 people within the school who will be engaged with the project.		
3	Schools-based piloting	All eight Lead teachers'	Schools completed		

	of STEM Ambassador activities & resources	trialled two D&T activities with Key Stage 3 groups with a STEM Ambassadors support. Many teachers saw great value in having an STEM Ambassador involved in their teaching and real world context to their topics and continued to use their activities and invite STEM Ambassadors in again.	two activities, but needed longer than the scheduled time to complete them, so we extended the project timeline for delivery in to the autumn term. One reason for this was the lack of D&T supporting Ambassadors being found in time or the right sort being available. STEMNET worked to attract more design, food technology and textile based Ambassadors to the fold.		
4	Interim training day with lead schools	A further two training days were offered to all leads schools to help them continue their planning, share their resource development and share ideas.	Not all schools were able to attend all meeting due to work pressures and last minute commitments. There was also a lack of senior support for such gatherings and teachers were siloed in their role. However, feedback forms from the meetings demonstrated that teachers found this sort of gathering interesting but concerns were raised about the Network stage and their		

			confidence in organising this and find the time to facilitate face to face meetings.		
5	Development of further STEM Ambassador activities by lead schools	Each lead school went on to devise and deliver another DT activity themselves with the support of a STEM Ambassador	Developing activities to deliver in timetable and to support curriculum planning for the term/year was not easy for schools to accommodate. They needed longer than the scheduled time to complete them, so we extended the project timeline for delivery in to the autumn term 2015.		
	<u>Network schools phase</u>				
6	Recruitment of network schools by lead schools	All schools were to try and attract three schools in to their local network to share learnings for their involvement with the LSEF project and share learnings around the new curriculum and its challenges, their two activities, best practice and working with STEM Ambassadors. Target being 24 Network schools These networks were to be sustainable beyond Autumn 2015 and regular meetings	This proved to be the biggest challenge to our Lead schools. Lack of resource, budget and planning time meant that initial leads made with local schools waned and meetings fell away. Without a lot of support Lead teachers were not able to build their networks and move relationships and outcomes on. STEMNET needed to facilitate meetings and nurture relationships. Where		

		scheduled and actions plans shared.	this was possible, networks developed, but for most, interest and desire remained but schools were not able to set up and sustain a network. STEMNET and the GLA agreed that we should support schools that were making head way and offer on-going support to other schools where interest was still evident - but to not force outputs within the original timeframe of the project and contract. Three Leads schools achieved a network. Two schools tried extensively, but in the end asked to leave the project due to lack of budget/change in staffing and available resource. The three made good headway with their networks and wanted to try and continue and STEMNET have made provision to continue support in to the autumn term 2015/16		
7	Implementation and publishing of successful practice	All eight Lead schools we to create template activities for STEMNET to develop in to a set of resources that could be	Only 11 activities were deemed suitable or diverse enough to develop.		

		used across D&T depts in London schools. These activities were to be published on the STEMNET database of resources and links sent to stakeholders and shared with other interest parties in July 2015.	STEMNET have made provision to continue to support these schools, along with those that had plans in place last year, to work towards yielding another 8 - 9 activities to sit with the initial set by January 2016. (as linked to Outcome 1.)		
	<u>Network Teachers</u>				
8	Teachers report increased confidence on post-activity survey and provide good support to Network schools.	All Network schools were visited by their Lead school at least once and by STEMNET and the D&T Advisor consulting on the on the project Questionnaires were completed by all schools to gather response to this support	The pre and post-project surveys of Network School teachers showed increases in average scores for Confidence in teaching and subject knowledge of D&T, confidence integrating people from the world of working into their teaching and their ability to talk to pupils about the use of D&T in careers. Three of the eight schools supported their Network schools well and continued communication and support with their planning, activity developing and with equipment where needed. The other		

			four had difficulty forming a network and they were unable to support network schools.		
9	Learning and achievement, including attitude to design and technology and engineering pathways are improved.	Teachers use resources and STEM ambassadors to make changes to classroom practice as demonstrated in questionnaire.	Quant and qual surveys and interviews were only able to assess the short-term impact of the first STEM Ambassador led sessions and initial meetings of the school networks. Impacts upon performance and course choices will only become apparent after networks have been running for at least a couple of years and after repeated interactions among STEM Ambassadors teachers and pupils. The primary aim of this project was to develop teachers' confidence, knowledge and skills through using STEM Ambassadors and support provided by STEMNET in using the D&T new curriculum. Longer term, increasing teachers' awareness and likelihood to request and plan STEM Ambassadors in to their D&T lessons in		

			the future Despite the limitations experienced, both qualitative survey and qualitative in-depth interviews were able to demonstrate benefits among both pupils and teachers (as outlined in the later sections of this report). All of the teachers interviewed agreed that the project had increased their confidence of teaching the new D&T curriculum, had encouraged them to try out new approaches, and had given them a better understanding of how to make use of volunteers from industry and academia.		
	<u>Pupils</u>				
10	Raised scores on the pupil and teacher post-activity survey regarding student aspiration, interest and achievement in design and technology.	Pupils self-evaluate as having a greater level of knowledge and confidence. Teachers evaluate pupils' achievement and aspirations to be higher after the evaluation.	The quantitative post-activity survey of Network and Lead School pupils also showed that: ● 89% found the activity enjoyable ● 83% believed it had taught them something they did		

			not know before ● 77% felt the STEM Ambassador had made the activity more interesting ● 69% said they found the activity inspiring ● 69% said it made them think differently about D&T. More detail on pupil and teacher outcomes can be found in Section 8.		
11	Questionnaires show an increased likelihood of pupils enjoying and pursuing pathways in STEM subjects, particularly design, technology and engineering	Pupil will report increased enjoyment of and likelihood to pursue pathways in STEM subjects.	The quantitative pre and post-project survey showed increases in average score for Lead and Network School pupils' perception of their understanding and enjoyment of D&T. The quantitative post-activity survey of Network and Lead School pupils also showed that: they found the activity enjoyable, and it taught them new things, and were inspired and now thought differently about D&T. All teachers surveyed		

			agreed that the STEM Ambassador had increased pupils' interest in D&T, while 19 agreed that their pupils were kept interested and engaged during the activities. More detail on pupil and teacher outcomes can be found in Section 8.		
	School System / 'Culture Change' Outcomes				
12	Production of highly rated resources and classroom activities that exemplify how STEM Ambassadors can enhance learning and teaching so that successful practice is captured and can be implemented in schools beyond the project. The resources will reflect a number of different pathways	The activities that were run (two per Lead school) were reviewed and shared.	The target number of resources to be shared was 20, but with the reduced number of network schools and the extended time line – there were only 11 that were deemed useful and appropriate to share in July 2015. With an extension (through sustaining the project another term) we are working with four more network schools to add more - and more diverse content to help D&T teachers access tried and tested resources. https://db.stemnet.org.uk/resources/profile/id/442 the Home Page has been viewed		

			288 times since July 2015. Within these resources it is clear that both the teacher and the students involved benefited and valued the support of a STEM Ambassador and that the project has helped them gain insight and confidence in the new areas of the D&T curriculum. They have also shared how the activities have been used throughout the school and embedded in their curriculum planning. The new resources will be added by January 2016 and memory sticks sent out to D&T depts. Across London. At present, with just access via our Resource Bank, it is not possible to judge the success of the resource with a wider audience, but it is hoped that in 2016, in collaboration with GLA and other stakeholder groups (such as DATA), we can gather more feedback.		
13	Robust and supportive school led networks:	Regular attendance by network members, with	As previously shared, network meetings and		

	so that schools share successful practice. Ensure range of different schools.	ongoing interaction, including informal and flexible mutual support. Questionnaires show increased confidence and good ratings of support.	continued support between groups was hard for most Lead schools and for Network schools to commit. Feedback from other Lead and Network schools showed that they valued the project and saw its merits, but in practical terms found it hard to sustain. In terms of sharing successful practice the content of the schools published resources is the most useful outcome. The schools that we engaged with were diverse – from all parts of London, many with a high Free School Meals count and low attainment levels, others with the reverse. There were also a mix of co-ed, all female (3 schools) and all boys (1 school).		
	<u>STEM Ambassadors</u>				
14	Rate their experience of volunteering and STEMNET support positively	(Formal and informal feedback is positive about school activity; resources; STEMNET support)	20 of the 22 teachers who completed a post-project survey considered the project to have been a success and that working with the STEM Ambassador		

			had increased their confidence in teaching Design Technology Of the 22 teachers who completed the post-activity survey (17 Lead School and 5 Network School) all of them agreed that the STEM Ambassador had increased pupils' interest in Design Technology, while 19 agreed that their pupils were kept interested and engaged during the activities. 7 interviews with STEM Ambassadors provided qualitative evidence of beneficial impacts arising from this project. Several of the STEM Ambassadors commented on the enthusiasm of the pupils and the quality of their questions. More detail on feedback can be found in Section 8 of this report.		

3.4 There was less activity taking place than was planned due to the lack of Network Schools committing to the project. By June, only 8 activities had taken place. As with the Lead Schools, each teacher and their class or groups of students were requested to complete the pre and post evaluation forms. The number of Network School pupils completing pre and post activity questionnaires was low – just 55 and 13 respectively, which was considerably less than the figure achieved from Lead Schools – 345 and 296 respectively. In part this was due to the Network School surveys coinciding with the busiest period of the secondary school year when D&T teachers were assessing course work projects and preparing pupils for exams. This problem was compounded by the fact that (as was originally intended in the planning of the project) the Network School surveys were administered by Lead School teachers, and due to their other commitments and being time poor, they were not able to chase and follow up this aspect as STEMNET were able to during the Lead School stage.

It had been planned that four group interviews were conducted with Network School teachers – two at the beginning to assess teachers' motivations, and two mid-way through to assess progress. However due to delays in recruiting Network Schools and difficulties arranging dates for the initial meetings it was not possible to conduct these interviews. To address this problem we decided to interview individual teachers by telephone or by email.

A couple of telephone interviews were successfully conducted, however other teachers were reluctant to provide the time despite repeated requests. Sending questions by email succeeded in gathering feedback from some (but not all) of the remaining. However the responses provided were not as detailed and there was no opportunity to ask follow-up questions to gather more detailed information.

Telephone interviews with STEM Ambassadors were conducted as planned and yielded valuable supporting data. Focus group sessions with pupils from Lead and Network Schools, and in-depth interviews with Network School teachers at the end of the project were successfully conducted as planned.

4. Evaluation Methodological Limitations

4.1 The quantitative survey of pupils did provide evidence of improved attitudes towards D&T lessons and career options. However the impact of the project may have been masked to some extent where pupils already held positive attitudes towards D&T. The project activities probably reinforced these positive attitudes (as demonstrated by the evidence from the qualitative interviews) however such outcomes are very difficult to capture with self-completion questionnaires.

As discussed above, gathering quantitative data from Network School teachers and pupils proved to be challenging. Due to the timing of the project this survey data had to be conducted during the busiest period of the secondary school year while course work projects were being completed and assessed and in the run up to GCSE and A level examinations. Due to the relatively small number of questionnaires that were completed by Network School pupils it is not possible to determine whether the differences in pre and post survey responses represent statistically significant changes in attitudes.

The qualitative methodology was able to capture a broader range of outcomes than was possible with the quantitative surveys. However the sample sizes were small, hence it is difficult to determine how representative these responses are of the rest of the target audience. This sample was to some extent self-selecting so may not have been representative of the full spectrum of opinions. Due to the time required to arrange school visits, interview pupils and teachers and analyse the data, it was not possible to conduct these interviews with all of the schools involved in the project.

Both the quantitative surveys and the qualitative interviews were only able to assess the short-term impact of the first STEM Ambassador led sessions and initial meetings of the school networks. Impacts upon GCSE performance and course choices will only become apparent after the network has been running for at least a couple of years and after repeated interactions among STEM Ambassadors teachers and pupils. The primary aim of this project was to develop teachers' confidence, knowledge and skills through using STEM Ambassadors and support provided by STEMNET in using the D&T new curriculum. Longer term, increasing teachers' awareness and likelihood to request and plan STEM Ambassadors in to their D&T lessons in the future may show greater impact.

Despite these limitations, both qualitative survey and qualitative in-depth interviews were able to demonstrate benefits among both pupils and teachers (as outlined in the later sections of this report).

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

We are intending to sustain the project until December 2015 (one additional term). After this period STEMNET will continue to support Lead and Network Schools in integrating the new curriculum and continued Ambassador support with D&T teaching (as aligned to Outcomes 2. and 3.) as well as created more D&T resources drawn from the School and STEM Ambassador collaborations. When completed, these new resource and the existing 11, will be saved on to a USB Memory Stick and distributed to the Head of D&T in each London secondary school.

We will use STEMNET's Ambassador database to monitor interaction between STEM Ambassadors and D&T teachers in the networked schools. Where possible the gathering of activity detail will be used to created more online resources to add to the current pool:
https://db.stemnet.org.uk/resources/profile/id/442

We will continue to gather feedback from D&T teachers via self-completion questionnaire for our own learning but will arrange for outcomes to be evaluated should this be a requirement of the GLA.

5. Project Costs and Funding

Table 2 - Project Income

	Original[1] Budget	Additional Funding	Revised Budget [Original + any Additional Funding]	Actual Spend	Variance [Revised budget – Actual]
Total LSEF Funding	£110,900	£10,450	£121,350.00	£121,350	Nil
Other Public Funding	n/a	n/a	n/a		
Other Private Funding	n/a	n/a	n/a		
In-kind support (e.g. by schools)	£36,700		£77,887.43	£77887.43	Nil
Total Project Funding	£147,600	£10,450	£199,237.43	£199,247.43	Nil

List details in-kind support below and estimate value.

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)	8400			21074.07	
Direct delivery costs e.g. consultants/HE (specify)					
Management and Administration Costs	46500			45765.93	
Training Costs					
Participant Costs (e.g. Expenses for travelling to venues, etc.)	46000			34060	
Publicity and Marketing Costs					
Teacher Supply / Cover Costs					
Other Participant Costs					
Evaluation Costs	10000	10450	20450	20450	Nil
Others as Required – Please detail in full					
Total Costs	110900	10450	121350	121350	

5.2 Please provide a commentary on Project Expenditure

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

This section should include:

The main repositioning of funds were due to an underspend on Resource Development and payments to Leads Schools against their milestones, versus the need for far more time allocated to the staffing and Project Management costs allocated to the project.

The underspend was born of a smaller cohort of schools being able to deliver against original outputs. This resulted in a reduced number of activities being developed in to usable resources and that were deemed suitable for publishing. Also, due to Lead schools not achieving their milestone, final payments were not issued within the allocated timeframe.

The overspend was due to the need for extended support of Lead Schools when developing and running their STEM Ambassador activities and in nurturing Network school relationships. This resulted in STEMNET having to match fund a much higher percentage of budget then profiled in to Direct Staffing Costs.

This need for the repositioning of funds was recognised by STEMNET and GLA two thirds of the way through the project and both parties agreed that allocation of funds was best repositioned to support the development of Lead to Network School relationships and moving sustained activity in to the autumn term (extending the project by a term) and in order to fulfil desire by those schools to continue to meet and to work toward yielding more D&T resources that demonstrate good practice and learnings from a wider group of schools.

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	-	**Revised Target Outcomes**	**Reason for change**
No. of Lead Schools	8	8	
No. of Network Schools	24	30	Schools were unable to commit to joining a network due to staff shortages and lack of budget but the project still attracted more

			teachers then envisaged **up to first meeting stage**
Number of teachers	40	25 Lead 27 Network* = **52** **this was the total number of teachers that attended a meeting / CPD presentation and took ideas away*	Schools were unable to commit to joining a network due to staff shortages and lack of budget
No. of Pupils	1442	965 Lead 195 Network **= 1,160**	Due to lack of established Network schools committing to be part of Network. Some joined but then were not able to commit to embedding activities in the Summer term. NB: STEMNET has a sustainability plan running in to December 2015 where more activities in schools will be planned and delivered
Wider group of **Schools** informed of project	1. Harris Academy, Bromley - Clare Key 2. Bullerswood Girls School - Joanne Kempton 3. Plumstead Manor - Deepa Dabasia and Siobhan Sawkins 4. Nower Hill - Mr Bower, 5. Hatch End - Emma Pacey 6. Harrow High – Jo Quinn, 7. Salvatorian – Mr Laszcz, 8. St Gregory's College – Mr A De Ageli 9. Gunnersbury School, Robert Patten	14	Lead schools attended local network or authority meetings and pitched the project to local schools.

	10. Barnhill School - Meenhaz Janar 11. St Paul's Way Trust – Elizabeth Gaskill 12. Rushcroft , Oriana Battistella 13. Willowfield school, Graham Eves 14. Woodside High School - Martey Newman		
Wider group of **Teachers** informed of project	See above box for named teachers	15	Lead schools attended local network or authority meetings and pitched the project to local schools.

7.1 Teacher Sub-Groups

The number of teachers that were directly engaged the project totalled 50, 23 of these were from the Lead School stage and 27 from the Network School stage (however not all teachers from this original number went on to continue to develop their relationship with the Leads schools post an initial meeting and presentation.)

The eight schools came together to discuss the current D&T curriculum, up and coming changes, what to plan for and how, creative ideas of embedding learning and working with STEM Ambassadors to develop and trial teaching interventions to enrich teaching, focussing on Key Stage 3. Most teachers were from the D&T department and teachers of 11 – 18 year old, all taught 11 – 14 years (KS3). Some teachers in attendance were science teachers and some responsible for STEM coordination in the school. Within the D&T curriculum, a number of teachers taught Product development and Design and Make, along with Resistant Materials and some Engineering, others were responsible for Textiles and Food Technology. No data was gathered on their career length or time at the school, nor if they were still NVQs and this was not deemed a necessary factor to the project.

LEAD SCHOOL PROJECT ACTIVITY LOG

School name:	Lead contact	Title of STEM Ambassador activity / project:	Request code:	Date of completion:	Was a sample activity used?	Year group of pupils	Number of pupils involved:	Number of STEM Ambassadors involved	Name of STEM Ambassador
Alexandra Park School	Laura Pearl Charlotte Blumenfeld Megan Taylor	Structures Project	LP10	09/07/2014	3. Iterative design	Age 13-14 Year 9	26	1	Emily Clare Bonner
		Food Aesthetics	LP11	07/10/2014	6. Biomimicry	Age 11-12 Year 7	21	1	Claire Toynton
Canons High School	Nick Riedel Anthony Fernandopulle	Design and constructing model flood proof house	LP06	16/06/2014	5. Mathematical m	Age 11-12 Year 7	180	1	Siu F Ng
		Wind power challenge	LP07	16/06/2014	8. Control systems	Age 11-12 Year 7	15	1	Chris Kemp
Frederick Bremer School	Maria Rodin Nigel Bell Deborah Colvin	Embedded Electronics & Fashion	LP13	18/07/2014	8. Control systems	years 7 and 8	50	1	Andrew Booth
		Regeneration of a local area	LP14	18/07/2014	6. Biomimicry	Years 7, 8 and 9	50	1	Haroon Yousuf
St.Bonaventures's RC School	Sinead Larkin Viv Qurrey	Biomimicry	LP05	30/06/2014	6. Biomimicry	Age 11-12 Year 7	25	1	Freddie Green
		Product design - iconic design	LP12	22/09/2014	2. Key events in de	Age 13-14 Year 9	25	1	Sian Murray
Sydenham School	Keith Matheson-McLaughlin/ Matt Guest (STEM line manager) Dave Bima (Hd D&T) Sherene Forrest - IT Amy Winters - textiles	Iterative design / Happy City	LP15	18/07/2014	3. Iterative design	Age 11-12 Year 7	220	1	Mr Daniele Ljazouli
		Food / Designing and creating breakfast food	LP16	21/10/2014	6. Biomimicry	Age 11-12 Year 7	220	1	Elena gul Aunon
Heathland School	Louise Cutts Will Brent Mrs S Evans Mr D Pike	Outdoor seating project	LP02	16/07/2014	3. Iterative design	Age 13-14 Year 9	24	1	Tina Patel
		Pastry Project	LP08	04/09/2014	6. Biomimicry	Age 12-13 Year 8	22	1	Claire Toynton
Townely Girls school	Jude Quinn/ Louise Butler Nevita Pandya	Biomimicry	LP04	16/07/2014	6. Biomimicry	Age 13-14 Year 9	20	1	Paul Kettell
		Modelling Developed ideas	LP09	30/06/2014	5. Mathematical m	Age 12-13 Year 8	19	1	Andrew Ward
Guru Nanak Sikh Academy	Ketan Lad James Copley Donna Soneji	Iterative Design -	ref 3348	04/11/2014	3. Iterative design	Age 12-13 Year 8	24	1	Zheng Li
		Modelling Developed ideas	ref 3348	05/11/2014	4. User-centred de	Age 13-14 Year 9	24	1	Zheng Li
Totals:	25						965	16	

Fig 5 *Lead Schools and Teachers – Activity log*

The 2nd phase of the project was due to commence in the Autumn Term where the Lead School teachers, with the support of STEMNET, were to establish and lead a network of local schools which will meet at least three times during the project to enable dissemination of practice; training for teachers from other schools and STEM Ambassadors; sharing of ideas; development of new

classroom approaches. Aligned to Outcomes 4. and 5., by January 2015, Six Network schools and 7 teachers joined together with three Lead school – all from D&T departments.

Fig 6 *Network Schools and Teachers – Activity log*

Table 5 – Teachers benefitting from the programme at Lead Schools and participating Network School

School	**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)**
Lead:						
A	*2*	*Unknown*	*Unknown*	*Unknown*	N/A	100
B	*3*	*Unknown*	*Unknown*	*Unknown*	N/A	100
C	*3*	*Unknown*	*Unknown*	*Unknown*	N/A	100
D	*5*	*Unknown*	*Unknown*	*Unknown*	N/A	100
E	*2*	*Unknown*	*Unknown*	*Unknown*	N/A	100
F	*3*	*Unknown*	*Unknown*	*Unknown*	N/A	100
G	*4*	*Unknown*	*Unknown*	*Unknown*	N/A	100
H	*3*	*Unknown*	*Unknown*	*Unknown*	N/A	100
Network						
J	*2*	*Unknown*	*Unknown*	*Unknown*	N/A	100
K	*2*	*Unknown*	*Unknown*	*Unknown*	N/A	100
L	*1*	*Unknown*	*Unknown*	*Unknown*	N/A	100
M	*1*	*Unknown*	*Unknown*	*Unknown*	N/A	100
N	*2*	*Unknown*	*Unknown*	*Unknown*	N/A	100
O	*1*	*Unknown*	*Unknown*	*Unknown*	N/A	100

**The above number of teachers are those that worked through the whole process, from initial meetings to holding a STEM Ambassador activity and continued communication between Lead and Network school. (We have excluding any schools that came to initial meetings and presentation but couldn't commit to continuing their relationship with their Lead school.)*

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

Lead schools, although initially agreeing to provide demographic data on their engaged pupils did not always provide this and those that did, they did not always provide all the data requested see below for pupils' demographic data tables.

The headings on each table denote which information we received from each participating school.

School and activity	No. pupils	% LAC	% FSM	% FSM last 6 yrs	% EAL	% SEN
A Flood protection	180	Not given	14	Not given	77	3
A Wind power challenge	10	Not given	0	Not given	80	0
B Fashion	50	Not given	20	Not given	Not given	Not given
B Wood Street	50	Not given	18	Not given	Not given	Not given
C Biomimicry	19	Not given	11	Not given	11	11
C Model garden design	19	Not given	11	Not given	11	11
D Happy City	7	Not given	20	Not given	7	0
D Food aesthetics		Not given		Not given		0
E Key events	19	Not given	16	Not given	68	0
E Biomimicry		Not given		Not given		0
F Iterative design	Not given	Not given	Not given	Not given		0
F Food aesthetics	Not given	Not given	Not given	Not given	Not given	0
H Iterative design	Not given	Not given	Not given	Not given	Not given	0
H Mathematical Modelling	Not given	Not given	Not given	Not given	Not given	0

G Cooking and Nutrition	24	Not given	Not given	Not given	58	14
G Outdoor seating		Not given	Not given	Not given		

	No. Male pupils	No. Female pupils	% Lower attaining	% Middle attaining	% Higher attaining
A Flood protection	97	83	Not given	Not given	Not given
A Wind power challenge	8	2	Not given	Not given	Not given
B Fashion	12	38	Not given	Not given	Not given
B Wood Street	35	15	Not given	Not given	Not given
C Biomimicry	Not given	Not given	Not given	Not given	Not given
C Model garden design	Not given	Not given	Not given	Not given	Not given
D Happy city	0	15	Not given	Not given	Not given
D Food aesthetics			Not given	Not given	Not given
E Key events	Not given				
E Biomimicry	Not given				
F Iterative design	Not given				
F Food aesthetics	Not given				
H Iterative design	Not given	Not given	Not given	Not given	Not given
H Mathematical Modelling	Not given	Not given	Not given	Not given	Not given
G Cooking and Nutrition	4	20	Not given	Not given	Not given
G Outdoor seating			Not given	Not given	Not given

	% Indian	% Pakistani	% Bangladeshi	% Asian Other	% Caribbean	% African	% Black Other	% White & Black Caribbean
A Flood protection	Not given							
A Wind power challenge	Not given							
B Fashion	Not given							
B Wood Street	Not given							
C Biomimicry	5	0	0	0	0	37	0	0
C – Model garden design	5	0	0	0	0	37	0	0
D Happy city	0	0	0	7	7	7	7	13
D Aesthetics	0	0	0					
E Key events	11	0	0	11	27	38		5
E Biomimicry		0	0					
F Iterative design	Not given							
F Food aesthetics	Not given							
H Iterative design	Not given							
H Academy - Mathematical Modelling	Not given							
G Cooking and Nutrition	21	7	0	8		4	4	0
G Outdoor seating			0					0

	% White & Black African	% White & Asian	% Mixed Other	% Chinese	% Other	% White British	% White Irish	% White Other
A Flood protection	Not given							
A Wind power challenge	Not given							
B Fashion	Not given							
B Wood Street	Not given							
C Biomimicry	0	5	11	0	0	37	0	5
C Model garden design	0	5	11	0	0	37	0	5
D Happy city	13	0	13	0	0	47	0	
D Food aesthetics		0		0	0		0	
E - Key events	5	0	10	0	0		0	5
E - Biomimicry		0		0	0		0	
F Iterative design	Not given							
F Food aesthetics	Not given							
H Iterative design	Not given							

H Mathematical Modelling	Not given							
G School Cooking and Nutrition	0	4	21	0	4	8	0	
G Outdoor seating	0			0			0	

For Network Schools, it was the responsibility of Lead Schools to gather data from their Network Schools, along with ensuring they fulfilled the evaluation needed, in terms of pre and post evaluation forms. Unfortunately Lead Schools found this a struggle to enforce, hence the lack of evaluation and data returned to STEMNET. In this regard no demographic data was supplied from the Network school in time for this report.

However, see the **Fig 7** for the Edubase general demographics on the Network Schools engaged in this project.

There are no statistic findings that can be compared across each group (Lead verses Network schools) or the schools with in them, as the data given is too disparate from each source.

School	School and+B:K+B:N	% LAC	% FSM	% FSM last 6 yrs	% EAL	No. Male pupils	No. Female pupils	% Lower attaining	% Middle attaining	% Higher attaining	Enthnicity
1	788	N/A	34.10%	57.70%	61.20%	375	410	27%	57%	15%	*unknown*
2	701	N/A	48.60%	66.90%	24.10%	365	335	9%	60%	31%	*unknown*
3		N/A									*unknown*
4	1696	N/A	3.30%	8.60%	11.50%	95	1600	5%	52%	42%	*unknown*
5	1387	N/A	22.00%	37.20%	19.20%	1380	10	14%	61%	25%	*unknown*
6	1322	N/A	42.00%	61.90%	50.20%	780	540	24%	53%	23%	*unknown*
7	1231	N/A	29.60%	51.40%	33.10%	635	600	19%	67%	14%	*unknown*
8	968	N/A	37.00%	62.10%	40.60%	520	450	N/A	N/A	N/A	*unknown*
9	1361	N/A	23.30%	39.40%	39.30%	95	1270	13%	55%	32%	*unknown*
10	1248	N/A	16.90%	33.10%	60.70%	655	595	15%	56%	29%	*unknown*
11	1280	N/A	7.00%	15.70%	10.30%	745	535	6%	40%	54%	*unknown*
12	892	N/A	32.70%	56.40%	39.40%	450	445	28%	48%	24%	*unknown*
13	1437	N/A	54.10%	71.80%	92.00%	0	1435	14%	54%	32%	*unknown*
14	833	N/A	27.70%	44.00%	19.30%	20	815	19%	64%	17%	*unknown*
15	1865	N/A	12.40%	20.10%	47.70%	995	870	13%	51%	36%	*unknown*
16	1585	N/A	26.50%	44.10%	48.80%	910	675	17%	52%	31%	*unknown*
17	989	N/A	20.50%	38.90%	53.10%	985	5	9%	58%	33%	*unknown*
18	1112	N/A	7.60%	13.50%	18.80%	20	1095	7%	43%	50%	*unknown*
19	1570	N/A	12.70%	24.70%	66.40%	840	730	10%	44%	46%	*unknown*
20	1403	N/A	23.30%	56.50%	60.70%	740	660	23%	56%	21%	*unknown*
21	1211	N/A	57.30%	75.80%	78.00%	650	560	30%	45%	26%	*unknown*
22	649	N/A	24.30%	45.50%	57.40%	370	280	24%	57%	19%	*unknown*

Fig 5 *Edubase general demographics on the Network Schools*

8. Project Impact

8.1 Lead School Phase

8.1.1 Teacher Outcomes

The number of teachers that were directly involved with the development and engagement with the project totalled 50. 25 of these were from the Lead school stage (Phase 1) and 27 were from the Network school stage (Phase 1).

The Lead school teachers were recruited in April 2014, contacts signed at the end of May 2015. As aligned to Outcome 2. - the group of 8 schools and lead contacts came together to discuss the current D & T curriculum, up and coming changes, what to plan for and how, creative ideas of embedding learning and how school staff will work with STEM Ambassadors to develop and trial teaching interventions and approaches to enrich teaching in focused aspects of Key Stage 3. Action plans were written up by each teacher concerned and in order for STEMNET to support each school in a way that best worked for them.

Activities were run with the support of STEM Ambassadors at various time throughout the Summer term 2014, a few activities spilled in to the Autumn (see the below table for Lead Schools activity log).

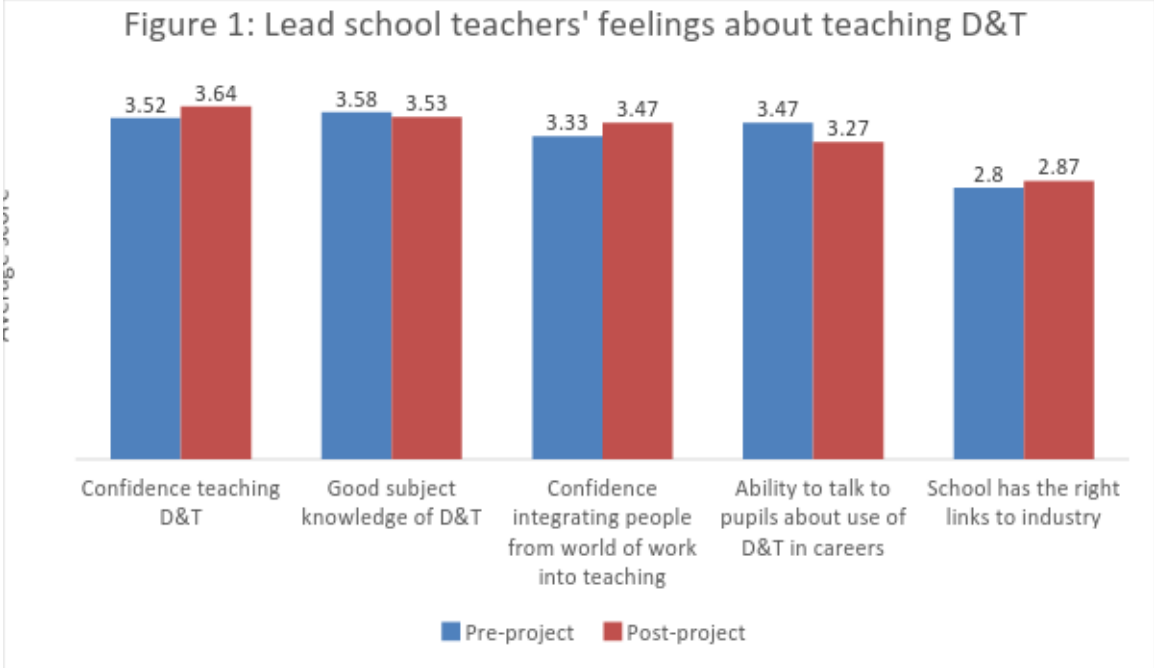
Date teacher intervention started:

Table 9 – Teacher Outcomes: teachers benefitting from the project

Table 9.1: Impact of project on Lead school teachers

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
I feel confidence teaching D&T	Self-completion questionnaire	19 teachers pre-project 17 teachers post-project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Mean score = 3.52	Mean score = 3.64
I have a good subject knowledge in D&T	As above	As above	As above	Mean score = 3.58	Mean score = 3.53
I feel confident integrating people from the world of work into their	As above	As above	As above	Mean score = 3.33	Mean score = 3,47

teaching					
I am able to talk to pupils about how D&T can be used in their future careers	As above	As above	As above	Mean score = 3.47	Mean score = 3.27
My school has the right links with industry to provide practical experience and examples to pupils	As above	As above	As above	Mean score = 2.80	Mean score = 2.87

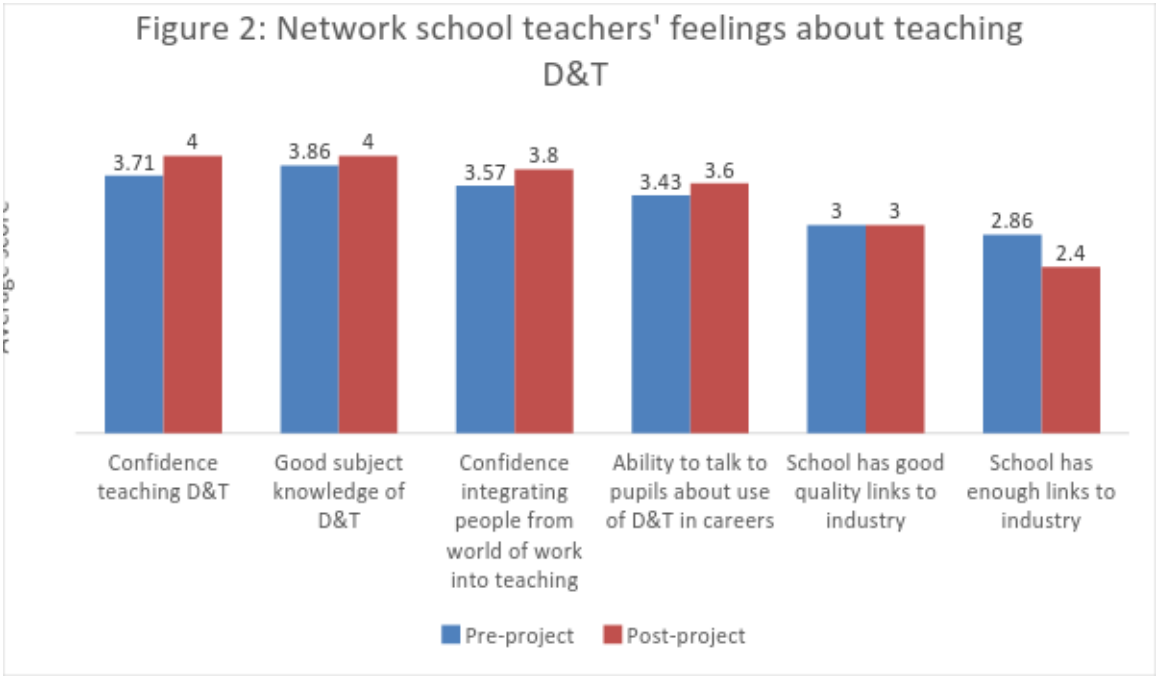


Sample = 19 pre-project; 17 post- project Lead School teachers

Table 9.2: Impact of project on Network school teachers

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
I feel confident teaching D&T	Self-completion questionnaire	7 teachers pre-project 5 teachers post-	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree	Mean score = 3.71	Mean score = 4.00

		project	● 2 = disagree ● 1 = strongly disagree ● 0 = don't know		
I have a good subject knowledge in D&T	As above	As above	As above	Mean score = 3.86	Mean score = 4.00
I feel confident integrating people from the world of work into their teaching	As above	As above	As above	Mean score = 3.57	Mean score = 3.80
I am able to talk to pupils about how D&T can be used in their future careers	As above	As above	As above	Mean score = 3.43	Mean score = 3.60
My school has good quality links with industry to provide practical experience and examples to pupils	As above	As above	As above	Mean score = 3.00	Mean score = 3.00
My school has enough links with industry to provide practical experience and examples to pupils	As above	As above	As above	Mean score = 2.86	Mean score = 2.40



Sample = 7 pre-project; 5 post- project Network School teachers

Eight Lead Schools with 23 teachers were actively involved in the project. 16 activities took place in these schools in total. Six Network school were able to participate last term with 9 teachers involved. 8 activities took place.

Data was collected through the process using Pre and Post hard copy and /or online versions with teachers and pupils. Focus group sessions with pupils from Lead and Network Schools, conducted as planned. Sending questions by email succeeded in gathering feedback from some (but not all) of the remaining. Telephone interviews with STEM Ambassadors were conducted as planned and yielded valuable supporting data

Group interviews were conducted with Network School teachers – two at the beginning to assess teachers' motivations, and two mid-way through to assess progress, and in-depth interviews with Network School teachers at the end of the project were successfully delivered.

Pre and post activity questionnaires were completed by teachers from seven of the eight Lead Schools and three of the six Network Schools.

- 19 Lead School teachers completed the pre-project survey; 17 the post-project survey
- 7 Network School teachers completed the pre-project survey; 5 the post-project survey.

20 of the 23 teachers who completed a post-project survey considered the project to have been a success and that working with the STEM Ambassador had increased their confidence in teaching Design & Technology.

As aligned to Outcomes 2 and 3, pre and post-project surveys of Lead School teachers showed increases in average scores for:

- Confidence in teaching D&T,
- Confidence in integrating people from the world of work into their teaching
- Their school has the right links to industry

The pre and post-project surveys of Network School teachers showed increases in average scores for:

- Confidence in teaching D&T
- Subject knowledge of D&T
- Confidence integrating people from the world of working into their teaching
- Ability to talk to pupils about the use of D&T in different careers

In-depth interviews with two Lead School and three Network School teachers provided further qualitative evidence of beneficial impacts. These teachers mentioned:

- Gaining greater understanding of how to use people from industry and academia in class – e.g. how to help them prepare for their session; the time required to plan such activities; how best to use them during the lesson
- Gaining inspiration and motivation for their teaching
- Updating their knowledge of contemporary science and engineering and of STEM career options
- Developing new activities and resources that they will use again and share with colleagues
- Developing links with their school's science department
- Gaining support from other teachers e.g. help with new curriculum, assessment of pupils' project work, sharing of resources and best practice
- Being able to use funds provided to buy new equipment and consumable materials

> "It's made me want to get in external people more … once you get your head around it, it's really a simple process" Network School teacher

> "You can share ideas, you can gain many more skills. I learnt a lot from it … it's great for your career development" Network School teacher

> "There seemed to be a lot of support available from various avenues which was very encouraging" Network School teacher

> "Made me think that there are other forms of strategies to get more out of your pupils … has made me look at other methods, activities" Lead School teacher

Teachers often mentioned how the STEM Ambassador provided expertise that they themselves lacked such as knowledge of industry, the latest developments in science and technology and specific technical skills required for the project activities.

All of the teachers interviewed agreed that the project had increased their confidence of teaching the new D&T curriculum, had encouraged them to try out new approaches, (aligned to Outcome 5)

and had given them a better understanding of how to make use of volunteers from industry and academia.

8.1.2 Pupils

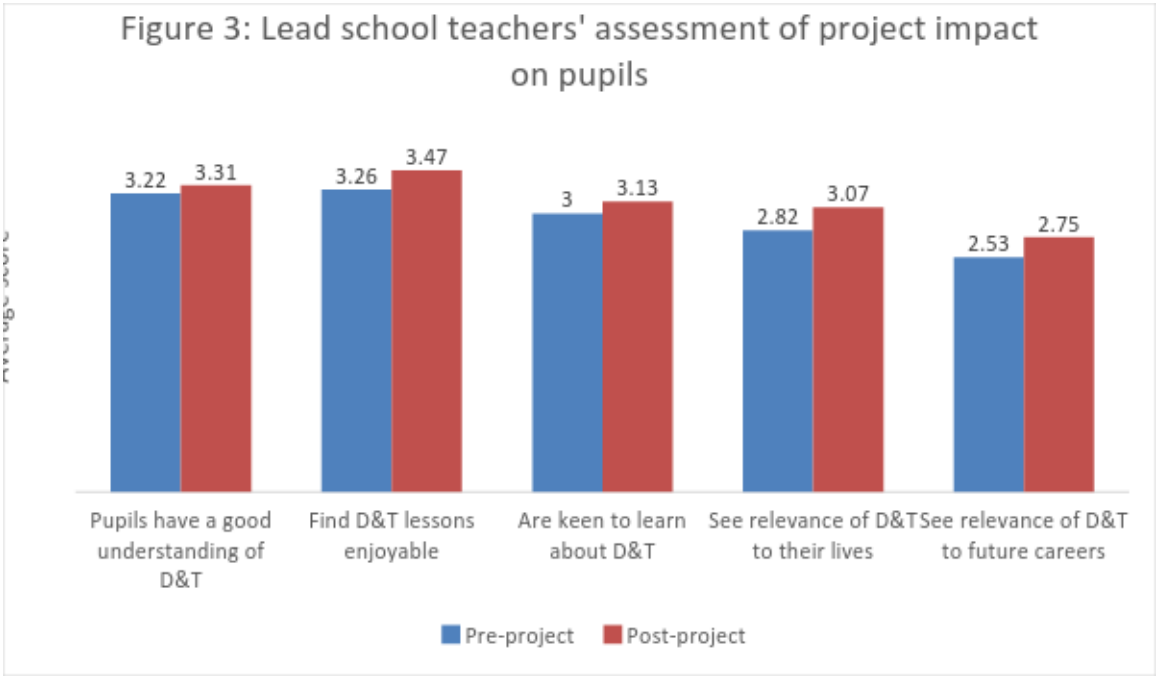
Date pupil intervention started: Lead Schools in the main June 2014 two schools held activities with their pupils in November 2015.

Table 11 – Pupil Outcomes for pupils benefitting from the project

Table 11.1: Lead school teachers' assessment of project impact upon pupils

The results below aligned to Outcomes 10, 11, 12 and 13

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
My pupils have a good understanding of D&T	Self-completion questionnaire	19 teachers pre-project 17 teachers post-project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Mean average score = 3.22	Mean average score 3.31
My pupils find D&T lessons enjoyable	As above	As above	As above	Mean average score = 3.26	Mean average score = 3.47
My pupils are keen to learn about D&T	As above	As above	As above	Mean average score = 3.00	Mean average score = 3.13
My pupils see the relevance of D&T to their everyday lives	As above	As above	As above	Mean average score = 2.82	Mean average score = 3.07
My pupils see the relevance of D&T to their future careers	As above	As above	As above	Mean average score = 2.53	Mean average score = 2.75



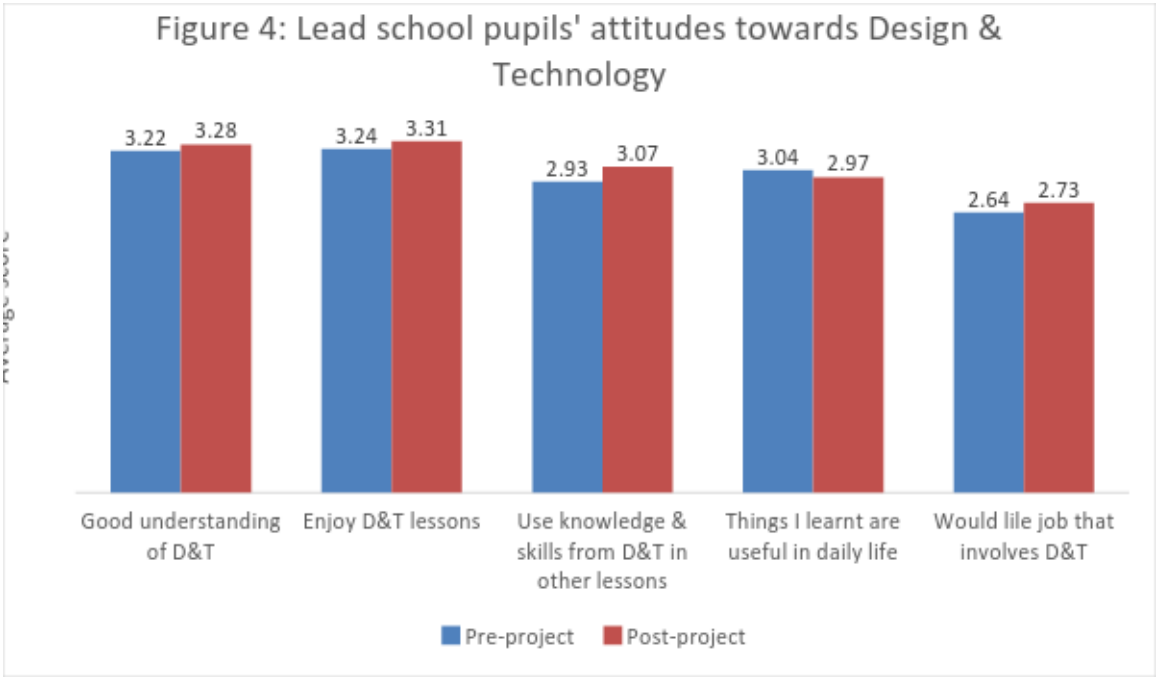
Sample = 19 pre-project; 17 post- project Lead School teachers

Table 11.2: Lead school pupils' attitudes towards Design & Technology

The results below aligned to Outcomes 10, 11, and 12.

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
I have a good understanding of D&T	Self-completion questionnaire	345 pupils pre-project 296 pupils post-project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Mean average score = 3.22	Mean average score = 3.28
I enjoy D&T lessons	As above	As above	As above	Mean average score = 3.24	Mean average score = 3.31
I use the knowledge & skills that I learn in D&T lessons in my other school work	As above	As above	As above	Mean average score = 2.93	Mean average score = 3.07

The things I have learnt from D&T lessons are useful in my daily life	As above	As above	As above	Mean average score = 3.04	Mean average score = 2.97
I would like to do a job that involves D&T in some way	As above	As above	As above	Mean average score = 2.64	Mean average score = 2.73

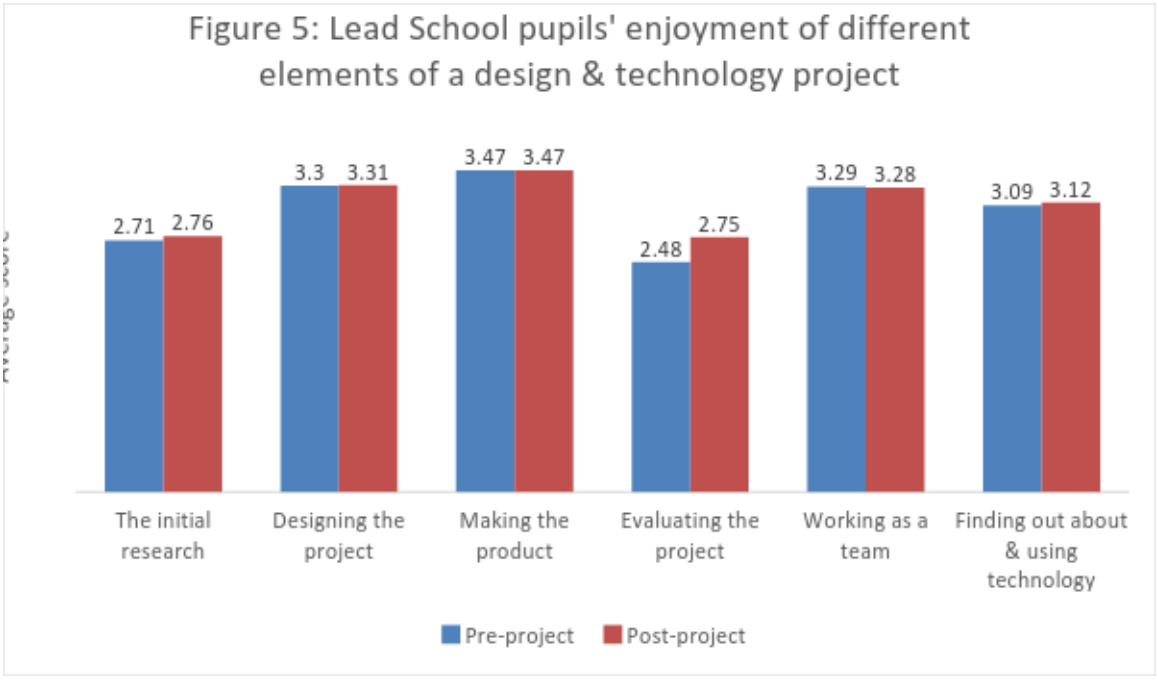


Sample = 345 pre-project and 296 post-project pupils

Table 11.3: Lead school pupils' enjoyment of Design & Technology projects

The results below aligned to Outcomes 10, 11 and 12.

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
I enjoy the initial research about the project	Self-completion questionnaire	345 pupils pre-project 296 pupils post-project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Mean average score = 2.71	Mean average score = 2.76
I enjoy designing the project	As above	As above	As above	Mean average score = 3.30	Mean average score = 3.31
I enjoy making the product	As above	As above	As above	Mean average score = 3.47	Mean average score = 3.47
I enjoy evaluating the success of the project	As above	As above	As above	Mean average score = 2.48	Mean average score = 2.75
I enjoy working as part of a team	As above	As above	As above	Mean average score = 3.29	Mean average score = 3.28
I enjoy finding out about & using technology	As above	As above	As above	Mean average score = 3.09	Mean average score = 3.12



London Schools Excellence Fund: **London STEM Learning Enrichment Networks**

Sample = 345 pre-project and 296 post-project pupils

8.2 Network Phase

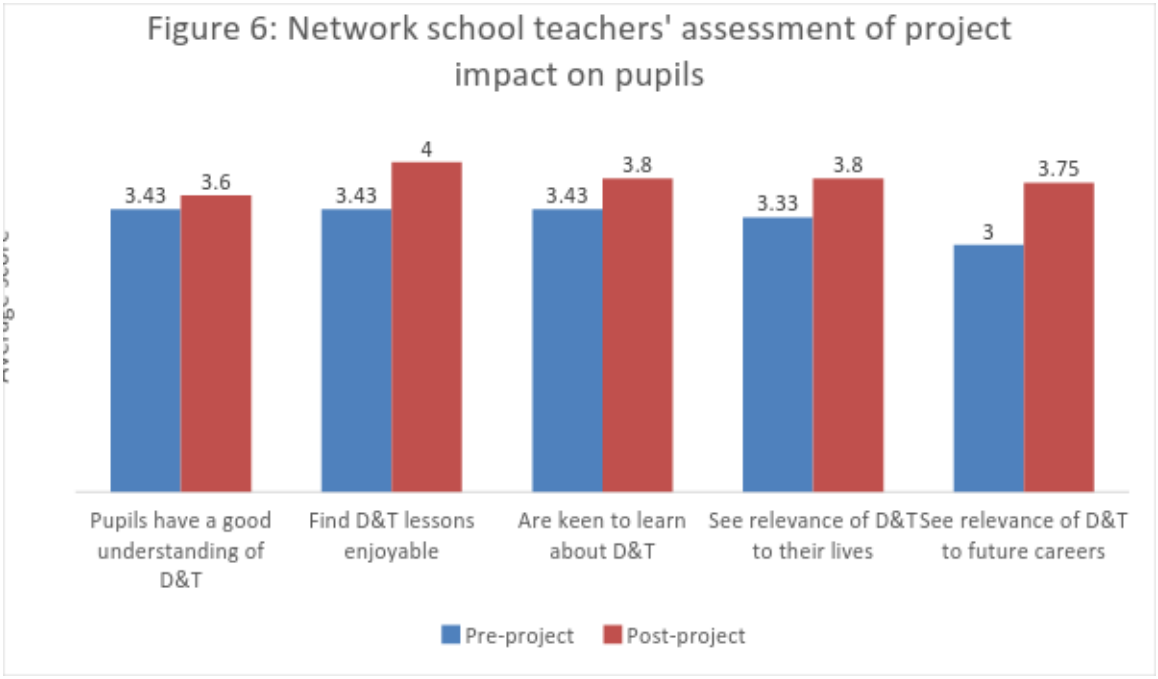
8.2.1 Pupils

Date pupil intervention started: Network Schools between March and July 2015. One in November 2015.

Table 11.4: Network school teachers' assessment of project impact upon pupils

The results below aligned to Outcomes 3, 9, 10 and 11.

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
My pupils have a good understanding of D&T	Self-completion questionnaire	7 teachers pre-project 5 teachers post-project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Mean average score = 3.43	Mean average score = 3.60
My pupils find D&T lessons enjoyable	As above	As above	As above	Mean average score = 3.43	Mean average score = 4.00
My pupils are keen to learn about D&T	As above	As above	As above	Mean average score = 3.43	Mean average score = 3.80
My pupils see the relevance of D&T to their everyday lives	As above	As above	As above	Mean average score = 3.33	Mean average score = 3.80
My pupils see the relevance of D&T to their future careers	As above	As above	As above	Mean average score = 3.00	Mean average score = 3.75



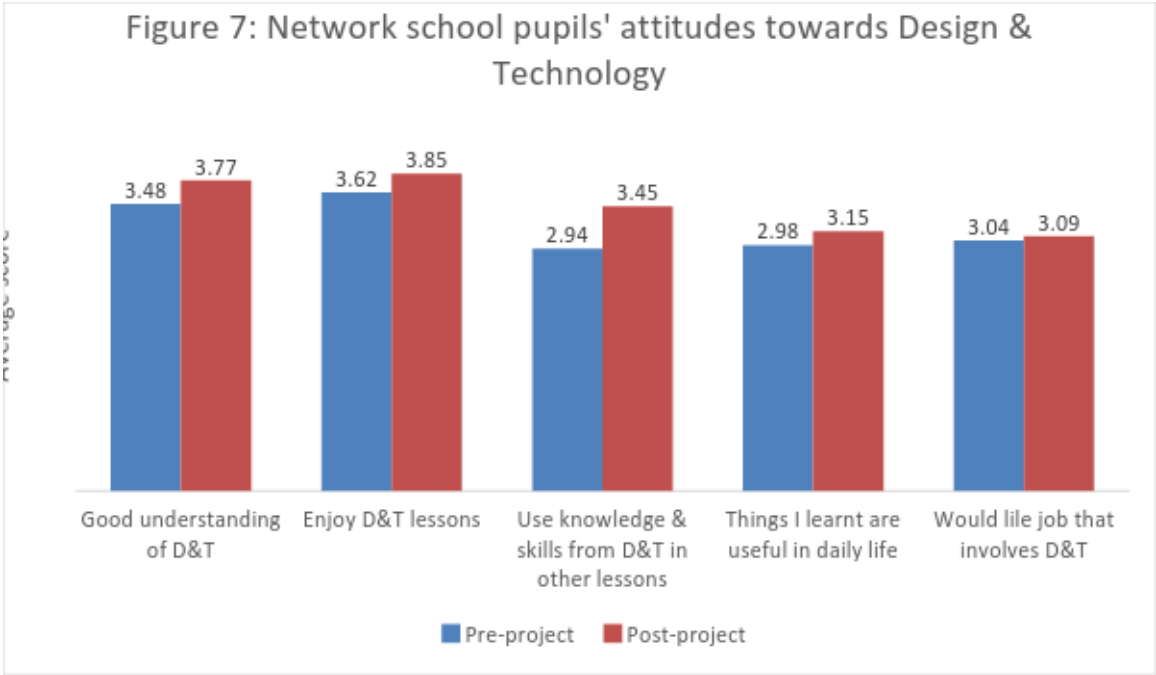
Sample = 7 pre-project, 5 post-project Network School teachers

Table 11.5: Network school pupils' attitudes towards Design & Technology

The results below aligned to Outcomes 3, 9, 10 and 11.

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
I have a good understanding of D&T	Self-completion questionnaire	55 pupils pre-project 13 pupils post-project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Mean average score = 3.48	Mean average score = 3.77
I enjoy D&T lessons	As above	As above	As above	Mean average score = 3.62	Mean average score = 3.85
I use the knowledge & skills I have learnt in D&T lessons in my other school work	As above	As above	As above	Mean average score = 2.94	Mean average score = 3.45

Things I have learnt from D&T lessons are useful in my daily life	As above	As above	As above	Mean average score = 2.98	Mean average score = 3.15
I would like to do a job that involves D&T in some way	As above	As above	As above	Mean average score = 3.04	Mean average score = 3.09

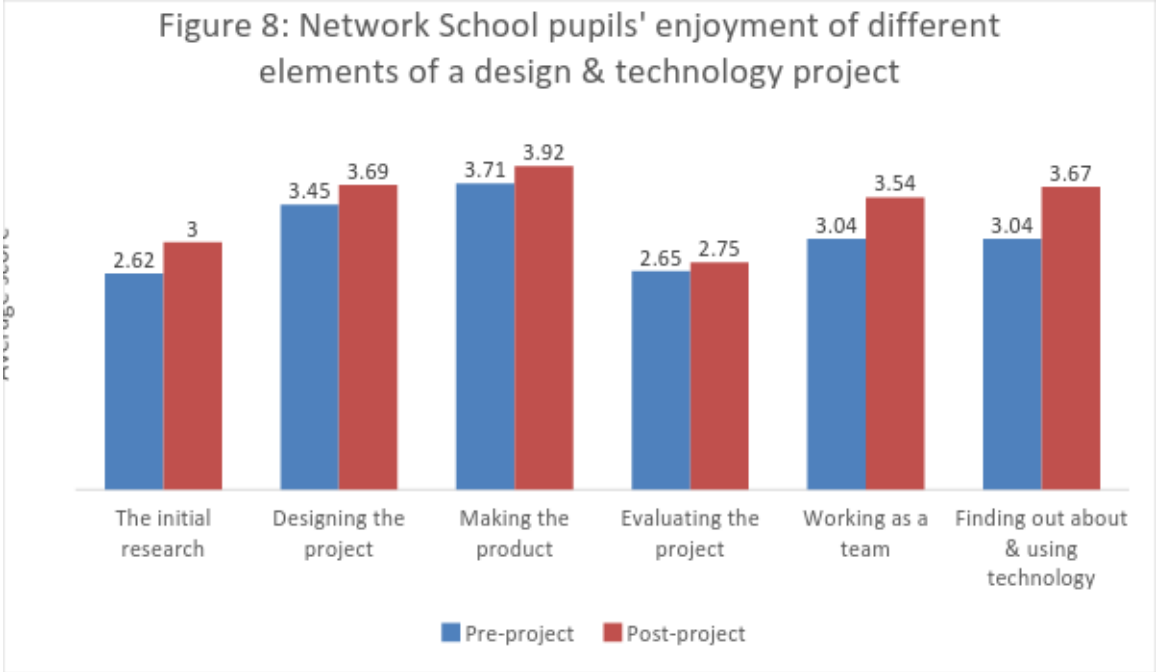


Sample = 55 pre-project; 13 post-project Network School pupils

Table 11.6: Network school pupils' enjoyment of Design & Technology

The results below aligned to Outcomes 3, 9, 10 and 11.

Target Outcome	Research method/ data collection	Sample characteristics	Metric used	1st Return and date of collection	2nd Return and date of collection
I enjoy the initial research about the project or problem I need to solve	Self-completion questionnaire	55 pupils pre-project 13 pupils post-project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Mean average score = 2.62	Mean average score = 3.00
I enjoy designing the project	As above	As above	As above	Mean average score = 3.45	Mean average score = 3.69
I enjoy making the product	As above	As above	As above	Mean average score = 3.71	Mean average score = 3.92
I enjoy evaluating the success of the project	As above	As above	As above	Mean average score = 2.65	Mean average score = 2.75
I enjoy working as part of a team	As above	As above	As above	Mean average score = 3.04	Mean average score = 3.54
I enjoy finding out about & using technology	As above	As above	As above	Mean average score = 3.04	Mean average score = 3.67



Sample = 55 pre-project; 13 post-project Network School pupils

8.2.2 Pre and post activity data was provided by pupils from all eight of the Lead Schools (345 and 296 respectively) and three of the six Network Schools (55 pre-activity, 13 post-activity). Responses were received from across the Year Groups involved in the project as shown below.

	Lead Schools		**Network Schools**	
	Pre	**Post**	**Pre**	**Post**
Year 7	45%	57%	9%	31%
Year 8	16%	10%	10%	15%
Year 9	38%	24%	62%	54%
Year 10	1%	8%	18%	0%

The quantitative pre and post-project survey showed increases in average score for Lead and Network School pupils' perception of their understanding and enjoyment of D&T. As aligned to Outcome 3. the surveys also showed increases in the number of pupils who said that they used skills learnt in D&T in other lessons and the number who were interested in D&T related careers. Among Network School pupils there was also an increase in the number of pupils who believed that what they learnt in D&T was useful in their daily lives.

The STEM Ambassador activities did not seem to have affected Lead School pupils attitudes towards D&T projects, however among Network School pupils there were increases in enjoyment of the initial research, designing the project, making the product, working as a team and finding out about technology.

The quantitative post-activity survey of Network and Lead School pupils also showed that:

- 89% found the activity enjoyable
- 83% believed it had taught them something they did not know before
- 77% felt the STEM Ambassador had made the activity more interesting
- 69% said they found the activity inspiring
- 69% said it made them think differently about D&T

Again aligned to Outcomes 2. and 3. 22 teachers who completed the post-activity survey (17 Lead School and 5 Network School) all of them agreed that the STEM Ambassador had increased pupils' interest in D&T, while 19 agreed that their pupils were kept interested and engaged during the activities.

In-depth interviews with pupils and their teachers at 4 schools (2 Lead and 2 Network schools) plus 7 interviews with STEM Ambassadors provided qualitative evidence of beneficial impacts arising from this project. Aligned to Outcome 3, all of the pupils interviewed enjoyed the activities and were able to describe them in detail a week or more after they had been completed. Aspects of the projects that pupils specifically mentioned enjoying were:

- Seeing real examples of high tech equipment and materials
- Talking to engineers and designers about their work

- Taking part in collaborative activities and working as a team
- Having a chance to be creativity and share ideas
- Working with materials and equipment they had not used before

"You could let your imagination run wild and do what you want" Lead school pupil

"We learnt how to incorporate different designs into our original one and how to make it better" Lead School pupil

"It's actually quite surprising that DT can be like art you can express your own opinion in your own way" Lead School pupil

"I liked how it [smart material] was just there and we could see it rather than just being on the computer. We could see it happening with our own eyes" Network School pupil

"We had loads of freedom in what we chose to do" Network School pupil

"We had to use our imaginations" Network School pupil

In one of the schools the pupils also mentioned gaining insight into the iterative design process in particular the need for patience, learning from mistakes, careful planning.

> "If you start planning it our sometimes you have to change it a bit because you find out something doesn't work … you have to use your brain and change it but not completely" Lead school pupil

> "You have to be really, really, really, really, patient" Lead school pupil

> "If things go wrong it's not the end of the world" Lead school pupil

Several of the STEM Ambassadors commented on the enthusiasm of the pupils and the quality of their questions.

> "They asked some really intelligent questions … I was terribly impressed by how thoughtful they were, pushing the boundaries of what I know about that sort of engineering" STEM Ambassador

> "They were very open, very excited, wanted to hear what I am talking about" STEM Ambassador

The teachers valued the opportunity for their pupils meeting people industry and academia with different perspectives and experiences, and who do not have the teacher's agenda of course work and exams.

> "I want then to talk to other adults" Lead School teacher

> "I've been there, I wasn't always a teacher but you lose touch with industry and how that works. [STEM Ambassadors] bring a real life problem and real life solutions" Network School teacher

> "I do tell the students I used to work in industry before by they see you as a teacher. So knowing someone who actually works in industry … they respect that a lot more" Network School teacher

> "It's hugely valuable having another friendly person who's not a teacher" Network School teacher

The teachers and the STEM Ambassadors were confident that the project increased pupils' understanding of the role of design, technology and engineering in real world their awareness of the range of STEM courses and careers.

> "Students when they are coming up to GCSE finding out about jobs that they didn't even know existed or they wouldn't even know what you needed to do to be able to do a job like that" STEM Ambassador

In three of the Network Schools the experience of meeting the STEM Ambassador had had a demonstrable impact on the pupils' opinions of engineers – successfully challenging negative stereotypes.

> "I thought engineers had something to do with cars" Network School pupils

> "I didn't know engineering had anything to do with that stuff [smart materials]" Network School pupils

> "I don't mean to be rude but I've always imagined engineers to be old people" Network School pupils

> "I didn't realise how much creativity they have to have to make something like that" Network School pupils

> "I just thought that all they did is fixed lights, so it's really opened my eyes a bit more" Network School pupils

Pupils at each of the schools demonstrated increased knowledge of specific areas of design, technology and engineering related to the activities they did and the STEM Ambassador's area of expertise. These included:

- How engineers and designers have been inspired by nature
- The importance of considering the needs of end-users when designing products
- The environmental and social factors that need to be considering in major civil engineering projects
- The properties of smart materials and how they are used in cutting-edge technologies and everyday products such as sportswear

> "You don't want [the building] to be destroying the nature and stuff … you need parks as well not just all around buildings" Lead school pupil

> "When you agree to a building you have to speak to others about it, surveys, check materials, check the site they were building it on" Lead school pupil

> "A turtle has a shell that's hard, [engineers] know that they could use that" Network School pupil

> "[Engineers] used a shape of a cactus to build a building so it wouldn't get as hot inside" Network School pupil

There was evidence of increased interest in design, technology and engineering among some pupils:

> "It showed you that it wasn't all just theory you can make different things" Lead school pupil

> "It's not all just heavy machinery and just cutting pieces of metal … it shows you that you can be more innovative" Lead school pupil

> "Showed me there is lots of things I can do in D&T if I want to go into it" Network School pupils

> "Now when I ever go in to Central London and I look at buildings I think what was that based on?" Network School pupil

> "My Dad's a builder and I never found it that interesting but the other day I was talking to him about it and I remembered about this" Network School pupil

Although for some pupils it appears that more intervention would be required to tackle the perception that design, technology and engineering is just 'not for them'.

> "It's not my style" Network School pupil

"I'm not good at science and maths" Network School pupil

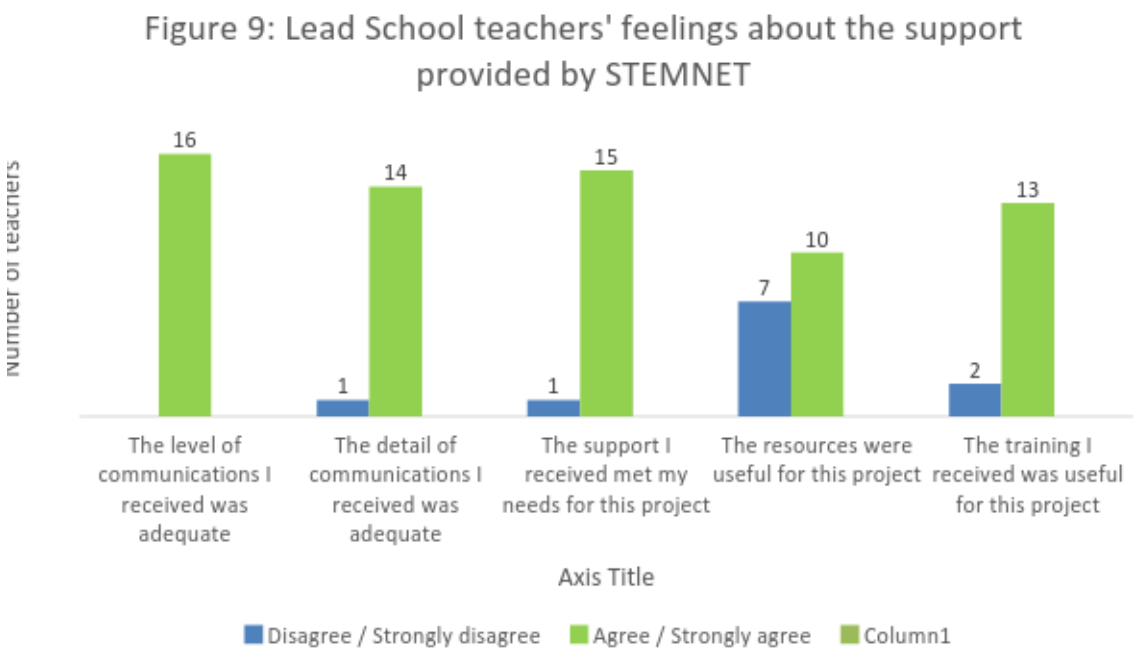
8.3 Wider System Outcomes

Table 13 – Wider System Outcomes

Table 13a: Lead School teachers' feelings about the support provided by STEMNET

The results below aligned to Outcomes

Target Outcome	**Behaviours and attitudes** **Outcomes aligned to:**	**Research method/ data collection**	**Sample characteristics**	***Metric***	**1st Return and date of collection**	**2nd Return and date of collection**
The level of communications I received was adequate	2, 4	Self-completion questionnaire	17 teachers post- project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Not applicable	Mean average score = 3.00
The detail of communications I received was adequate	2	As above	As above	As above	As above	Mean average score = 2.71
The support I received met my needs for this project	4, 8, 12, 13	As above	As above	As above	As above	Mean average score = 2.88
The resources were useful for this project	3, 7,9, 12	As above	As above	As above	As above	Mean average score = 2.76
The training I received was useful for this project	4 , 8	As above	As above	As above	As above	Mean average score = 2.70



Sample = 17 Lead School teachers

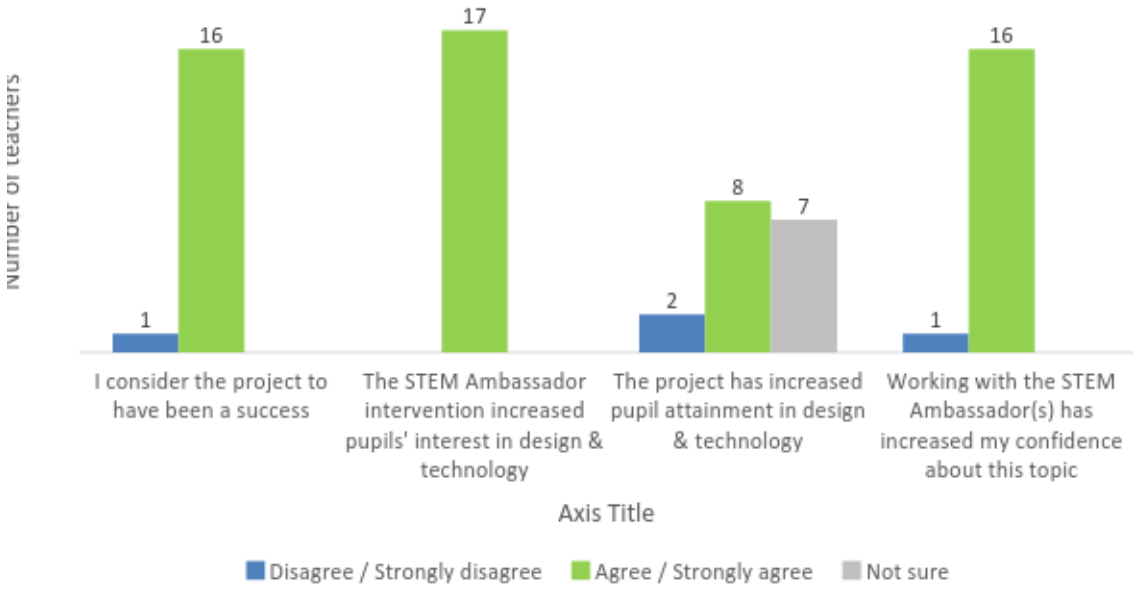
As aligned to Outcomes 4. And 5, from the Reponses above and below Lead teachers felt the project was a success, they felt that STEMNET training and support was beneficial to them

Table13b: Lead School teachers' feeling about how the project was run

Target Outcome	**Behaviours and attitudes** **Outcomes aligned to:**	**Research method/ data collection**	**Sample characteristics**	***Metric***	**1st Return and date of collection**	**2nd Return and date of collection**
I consider the project to have been a success	1, 2, 3, 4,5, 7, 8, 9, 10, 11, 12, 13	Self-completion questionnaire	17 teachers post- project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Not applicable	Mean average score = 3.41
The STEM Ambassador intervention increased pupils' interest in design & technology	10, 11	As above	As above	As above	As above	Mean average score = 3.41
The project has increased pupil attainment in design & technology	10, 11	As above	As above	As above	As above	Mean average score = 1.76

Working with the STEM Ambassador(s) has increased my confidence about this topic	2, 3, 5, 8, 9	As above	As above	As above	As above	Mean average score = 3.29
Pupils were kept interested and engaged during the project	10, 11	As above	As above	As above	As above	Mean average score = 3.00

Figure 10: Lead School teachers' feelings about the project

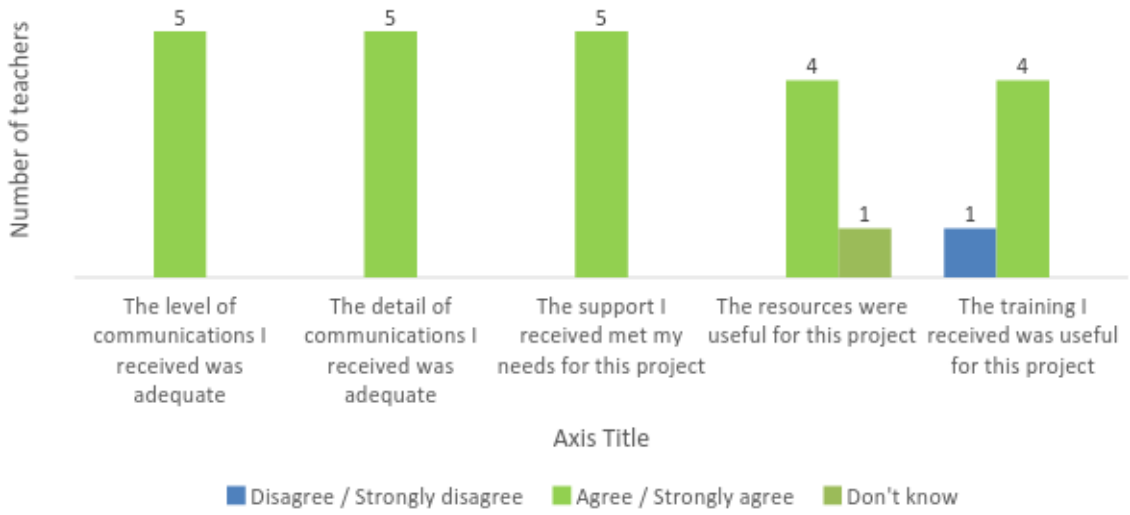


Sample = 17 Lead School teachers

Table13c: Network School teachers' feelings about the support provided by STEMNET

Target Outcome	**Behaviours and attitudes Outcomes aligned to:**	Research method/ data collection	Sample characteristics	*Metric*	1st Return and date of collection	2nd Return and date of collection
The level of communications I received was adequate	2, 4	Self-completion questionnaire	5 teachers post- project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Not applicable	Mean average score = 3.80
The detail of communications I received was adequate	2	As above	As above	As above	As above	Mean average score = 3.80
The support I received met my needs for this project	4, 8, 12, 13	As above	As above	As above	As above	Mean average score = 3.80
The resources were useful for this project	3, 7,9, 12	As above	As above	As above	As above	Mean average score = 3.20
The training I received was useful for this project	4 , 8	As above	As above	As above	As above	Mean average score = 3.00

Figure 11: Network School teachers' opinions about the support provided by STEMNET



Sample = 5 Network School teachers

Table13b: Network School teachers' feeling about how the project was run

Target Outcome	**Behaviours and attitudes Outcomes aligned to:**	**Research method/ data collection**	**Sample characteristics**	***Metric***	**1st Return and date of collection**	**2nd Return and date of collection**
I consider the project to have been a success	8, 9, 10, 11, 12, 13	Self-completion questionnaire	5 teachers post- project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Not applicable	Mean average score = 3.40
The STEM Ambassador intervention increased pupils' interest in design & technology	10, 11	As above	As above	As above	As above	Mean average score = 3.80
The project has increased pupil attainment in design & technology	10, 11	As above	As above	As above	As above	Mean average score = 2.40
Working with the STEM Ambassador(s) has increased my confidence about this topic	2, 3, 5, 8, 9	As above	As above	As above	As above	Mean average score = 3.40
Pupils were kept interested and engaged during the project	10, 11	As above	As above	As above	As above	Mean average score = 3.60

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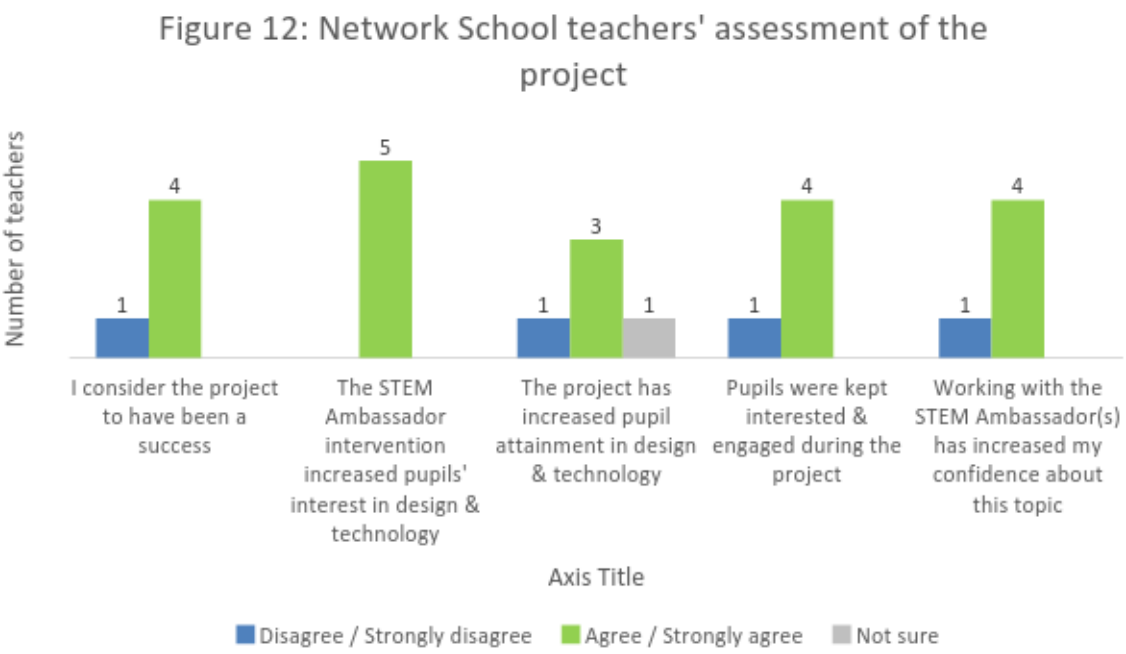
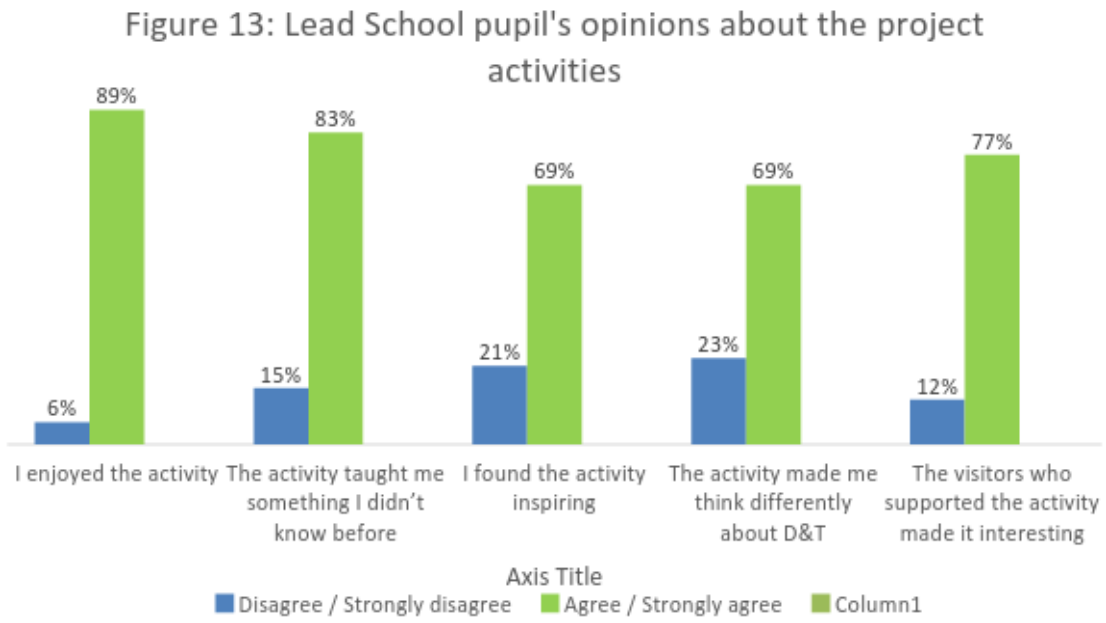


Sample = 5 Network School teachers

Table13c: Lead School pupils feeling about the project

As aligned to Outcomes 2, 3, 10 and 11, Lead pupils found a visitor from the STEM Ambassador support inspiring and it made their lesson more interesting.

Target Outcome	**Research method/ data collection**	**Sample characteristics**	***Metric***	**1st Return and date of collection**	**2nd Return and date of collection**
I enjoyed the activity	Self-completion questionnaire	296 pupils post- project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Not applicable	Mean average score = 3.15
The activity taught me something I didn't know before	As above	As above	As above	As above	Mean average score = 3.26
I found the activity inspiring	As above	As above	As above	As above	Mean average score = 2.71
The activity made me think differently about D&T	As above	As above	As above	As above	Mean average score = 2.73
The visitors who supported the activity made it interesting	As above	As above	As above	As above	Mean average score = 2.83



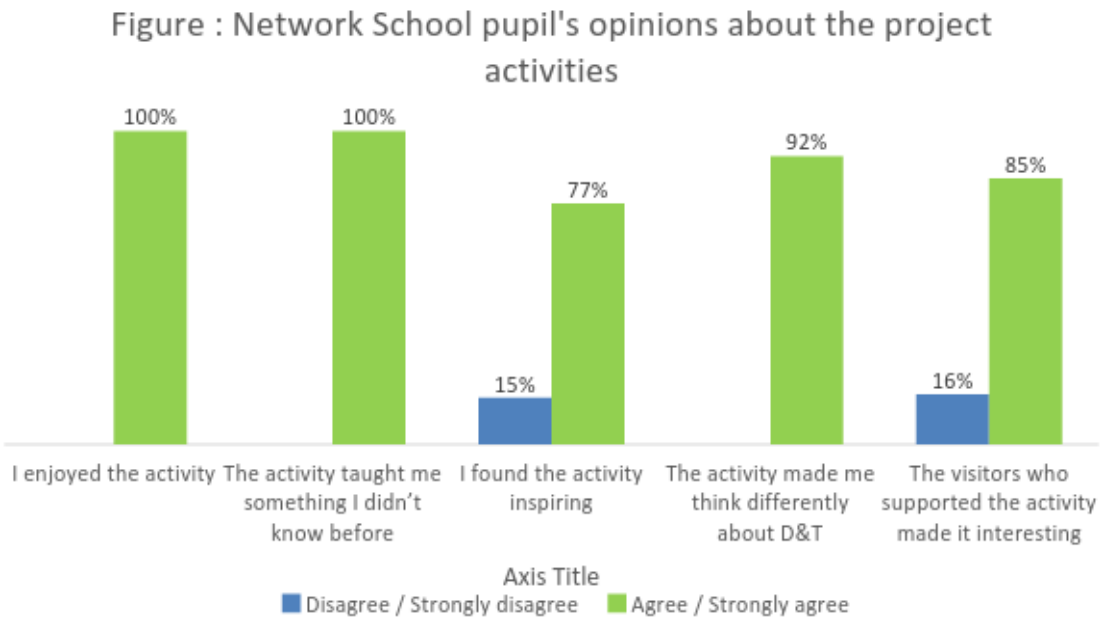
Sample = 296 Lead School pupils

Table13d: Network School pupils feeling about the project

As aligned to Outcome 9, 10 and 11, Network pupils found a visitor from the STEM Ambassador support inspiring and it made their lesson more interesting.

Target Outcome	**Research method/ data collection**	**Sample characteristics**	***Metric***	**1st Return and date of collection**	**2nd Return and date of collection**
I enjoyed the activity	Self-completion questionnaire	13 pupils post- project	Mean score based on a 4-1 scale ● 4 = strong agree ● 3 = agree ● 2 = disagree ● 1 = strongly disagree ● 0 = don't know	Not applicable	Mean average score = 3.77
The activity taught me something I didn't know before	As above	As above	As above	As above	Mean average score = 3.96
I found the activity inspiring	As above	As above	As above	As above	Mean average score = 3.08
The activity made me think differently about D&T	As above	As above	As above	As above	Mean average score = 3.50

The visitors who supported the activity made it interesting	As above	As above	As above	As above	Mean average score = 3.31



Sample = 13 Network School pupils

8.3.1 As aligned to Outcomes 8 and 9, feedback from Network School teachers (from interviews and post-session questionnaires) showed that they found the Lead schools briefing sessions at the start of the project to have been inspiring, informative and useful.

> "The first meeting was excellent; very informative and supportive. I particularly liked seeing evidence of the projects first hand and hearing the teachers' experiences" Network School teacher

> "It was useful to meet the team involved in the project, we were given a huge amount of information about resources and help available" Network School teacher

> "Feeling inspired and excited about the activities" Network School teacher

> "Good to discuss with colleagues from other schools" Network School teacher

> "Wonderful session with supportive professionals" Network School teacher

Network school teachers mentioned many aspects of the briefing session that they found especially useful:

- Sharing ideas, good practice, experiences and resources with colleagues from other schools
- Learning about changes to the National Curriculum and the requirements of particular exam boards
- Learning about STEMNET and its STEM Ambassador programme

Following the initial briefing session Network School teachers said that they would share this information with colleagues during departmental meetings and would incorporate the activities into their existing Schemes of Work.

As described above in Section 8.2 all of the pupils who were interviewed had found the activities fun, challenging and thought-provoking

> "I found it rather fun because we've never really done that before … we learnt how to incorporate different designs into our original one and how to make it better"
> *Lead School pupil*

The STEM Ambassadors had also found the experience enjoyable and worthwhile. For some of the less experienced STEM Ambassadors the project had increased their confidence and inspired them to do more work with secondary schools.

> "I've never worked with school children before. I didn't know how they'd react and they reacted very positively" STEM Ambassador

> "You have to sit down and think about what you do enjoy about your job. I find that quite satisfying. It helps self-motivate when I go back to the work-place" STEM Ambassador
>
> "I came away from the first session I'd done feeling incredibly impressed" STEM Ambassador

8.4 Impact Timelines

STEMNET expected there to be in part, an immediate effect on the teachers involved in the programme. This was due to the time spent with an experienced D&T consultant, the focus on the old verses new curriculum and what to expect and advise on planning and challenges to be met and considered. Later impacts would be expected toward the middle of Phase 2 of the project and this was the point when Leads Schools invite Network School to join them and sharing best practice, example activities and the difference between D&T departments in the network schools and where more support might be needed.

From the feedback received, both after initial network meetings and in terms of the pre and post evaluation from activities, we did find immediate value and confidence was gained from the initial group meetings and the network meeting from both Leads Schools and Network Schools.

Pupil feedback was gathered pre and post interventions with STEM Ambassador activities. Because of the difference in timing between schools initiation to the project and when they actually delivered their activity and then went on to completed their feedback forms, is it hard to comment on the timeframes attached to this adjustment. We expected immediate value and clarity to be experienced post activity from pupils and from the feedback we received (as outlined in 8.2.1 of this report), the quantitative pre and post-project survey showed increases in average score for Lead and Network School pupils' perception of their understanding and enjoyment of D&T. There were also increases in the number of pupils who said that they used skills learnt in D&T in other lessons and the number who were interested in D&T related careers. Network School pupils showed an increase among pupils that felt that what they learnt in D&T was useful in their daily lives.

The STEM Ambassador activities did not seem to have affected Lead School pupils' attitudes towards D&T projects, however among Network School pupils there was evidence of an increase in enjoyment with the initial research, designing and making the product, working as a team and finding out about technology.

9. Reflection on overall project impact

STEMNET are overall satisfied that this project reached a high proportion of its aims. Particularly in terms of the Lead Schools Phase. We were able to work with eight schools of differing types across London and although finding schools and keeping their commitment to the project has often been a challenge, and there was some drop out, the desire for the schools to be involved was apparent, demonstrating the appeal of this sort of level of support and guidance for school and especially teachers of D&T.

As aligned to Outcome 3, the quantitative post-activity survey of Network and Lead School pupils also showed that:

- 89% found the activity enjoyable
- 83% believed it had taught them something they did not know before
- 77% felt the STEM Ambassador had made the activity more interesting
- 69% said they found the activity inspiring
- 69% said it made them think differently about D&T

Pre and post-project surveys of Lead School teachers showed increases in average scores for:

- Confidence in teaching D&T
- Confidence in integrating people from the world of work into their teaching
- Their school has the right links to industry

As aligned to Outcomes 8 and 9, the pre and post-project surveys of Network School teachers showed increases in average scores for:

- Confidence in teaching D&T
- Subject knowledge of D&T
- Confidence integrating people from the world of working into their teaching
- Ability to talk to pupils about the use of D&T in different careers

While we were dealing with extremely small base sizes, the majority of network and Lead Schools felt the activity to have been a success, and found the resources and support useful.

The quantitative and qualitative evaluation demonstrates that this project has had wide ranging benefits for pupils and teachers in both Lead and Network Schools, as well as for the STEM Ambassador volunteers.

Overall evaluation shows us that teachers and pupils from the Lead Schools enjoyed their lessons or activities more with support and when using STEM Ambassadors, and this was also recognised by the Network schools. Where those taking part struggled was to form a network of schools, planning and sticking to meetings and to then go on and communicate regularly without intervention from STEMNET. Part of the objective of this project was to form self-sustaining networks, but we don't feel that this has been achieved and without more on-going support, we do not have the evidence or believe that networks could be sustained.

The project was successful in bringing together engineers and designers from industry and academia, teachers and pupils. Teachers greatly valued the opportunity for their pupils to meet adults from outside of school who could provide compelling experiences and personal narratives of STEM careers. They also valued the opportunity to update their own knowledge of engineering and to share ideas, resources and experiences with D&T teachers from other schools.

The project was successful in introducing teachers to new approaches to teaching D&T and increasing their confidence in teaching the new curriculum. For some of the teachers this was the first time that they had encountered the STEM Ambassadors and they were keen to continue working with them in future.

The pupils enjoyed engaging in creative, collaborative projects developed and delivered by engineers from academia and industry. These activities were successful in deepening their understanding of how design and engineering are applied to real world and increased their knowledge of cutting-edge technology such as smart materials, biomimicry and food technology. The project successfully challenged negative stereotypes of engineers, broadened pupils' perception of design and engineering related jobs and increase the level of interest in such career options.

For the STEM Ambassadors the project was a rewarding and inspiring experience, motivating them to do further work with secondary schools. They greatly appreciated the opportunity to promote their field of work to pupils and teachers and to develop their communication skills.

The results from the evaluation show that most of the anticipated outcomes in the Theory of Change model were achieved specifically:

- Greater awareness by Lead School teachers of new approaches to enrich learning and teaching
- Lead School teachers have increased confidence in delivering innovative STEM Ambassador activities
- Increased STEM Ambassador confidence to support D&T teaching
- Local STEM learning networks supporting schools to share and develop practice
- Students enjoy innovative STEM Ambassador contributions and gain increased knowledge of everyday applications of D&T
- Teachers gain new KS3 D&T subject knowledge (everyday applications) and increased confidence in innovative approaches

Over and above the findings found in our evaluation, it is important to note that this project was relatively short and with limited intervention and opportunity to embed enrichment in schools and among teachers. We would expect more impact and an upturn in perceptions, confidence and enjoyment of the subject to be gained from continuous and/or regularly visits from STEM Ambassadors for pupils and teachers to really benefit. Producing and publishing the resources created, which were designed to support integration of the curriculum and new areas of the D&T syllabus, also demonstrates the collaboration of STEM Ambassadors with teachers. This has created a legacy of the project aims and the means to be shared with a wider group.

In terms of one of aims in the Theory for Change: "school led networks are sustainable and new ones can be established based on learning from this project" - from where we are with the project (recent completion of activities with Network Schools and more to develop when sustaining the project in to December 2015), it is too early to determine whether the outcome has been achieved. Likewise it is too early to determine whether the long-term goals of "Improved and enriched D&T teaching with embedded contribution of STEM Ambassadors" and "improved outcomes in Key Stage 3 D&T" have been achieved. However the evaluation data does suggest that the pupils who have already participated in STEM Ambassador led activities do have "better understanding of real world applications and roles" and are "more aware of pathways that lead to careers in engineering and technology".

10. *Value for Money*

10.1 Apportionment of the costs across the activity

Table 3 - Project Expenditure

Broad type of activity	Estimated % project activity	£ Estimated cost, including in kind
Producing/Disseminating Materials/Resources	10%	£12,200
Teacher CPD (face to face/online etc)	15%	£18,100
Events/Networks for Teachers	15%	£18,100
Teacher 1:1 support	15%	£18,100
Events/Networks for Pupils	15%	£18,100
Reporting to GLA	5%	£6,100
Other: Evaluation	15%	£18,000
TOTAL	90%	£108,700

In terms of the original budget allocation, 25% was attributed to resource production and dissemination, this was disproportionate to activity and resource development in the end. Had the project developed and rolled out closer to milestone timings intended initially, there would have been more time spent on 1:1 support and CPD, which in the end totalled around 45% of the budgetary spend, and for a project with these aims the budget would have been better positioned to allocate 60% to teacher CPD, network meeting and pupil facing activity.

11. Reflection on project delivery

11.1 Key Enablers and Barriers to Achievement

From interviews with Lead and Network School teachers and pupils, and with STEM Ambassadors the following enablers and barriers to achieving project goals have been identified:

- The timing of activities and of the STEM Ambassadors' interventions needs to dovetail with DT teacher's annual programme of work – i.e. avoid times when teachers are busy with exams and assessing course work and ideally before they have set-up their scheme of work for the year

- Teachers need time to arrange and attend meetings with teachers at other schools.

- Reducing the administrative load for teachers is a key enabler for example; helping to organise and run school network meetings; finding STEM Ambassadors with particular specialisms, providing ready-made activities that teachers and STEM Ambassadors can run or modify to suit their needs.

- Initiating and sustaining contact between the Lead School, Network School and the STEM Ambassadors is crucial to the success a project of this type and timeline.

- There needs to be a shared understanding of the goals, objectives and methods of the project among all partners of this project in particular about the role of STEMNET, the STEM Ambassadors and the role of the Lead School teachers. Key messages need to be reiterated through multiple channels.

- Email is the primary method by which teachers, STEM Ambassadors and STEMNET communicate with one another. This communication channel needs to be exploited to the full and up-to-date contact lists maintained

- Flexibility of approach is crucial to ensure that activities meet the particular needs of the teachers and pupils. Resources provided by STEMNET and Lead Schools must be easy to modify so as to incorporate into existing schemes of work; likewise STEM Ambassadors must be willing and able to adapt their approach to what they find the teacher wants them to do.

- Setting aside time for the teacher and STEM Ambassador to plan activities well in advance of their visit is an important factors in successful projects. Time needs to be allocated for them to work out a lesson plan and for the teacher to informally assess what support the STEM Ambassador will require.

- Some pupils will need extra encouragement and support to engage in creative activities. Teachers need to build their confidence in taking risks and convey the idea that failure is an opportunity to learn.

- Teachers need guidance in how best to use STEM Ambassadors – even those who have previous experience bringing into school people from industry and academia. The STEM Ambassador needs to provide a mix of activities and presentations and wherever possible bring along high tech materials and equipment from their work that pupils will not have encountered before.

- The support and training STEMNET provides its Ambassadors is vital for building their confidence and ability to be proactive, enthusiastic and willing to interact with pupils. Many STEM Ambassadors will not have previously worked with school pupils of this age.

- The Science Ambassadors are volunteers who have to fit these activities around their work commitment. It is therefore important that they feel supported and properly prepared, and that the experience is rewarding for them.

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?*
- *Did the management or delivery mechanisms change during the lifetime of the project and what were the before or after effects?*

11.3 Future Sustainability and Forward Planning

The future sustainability of this project will ultimately hinge around teachers' willingness to commit time to meet with the other schools and plan future visits by STEM Ambassadors.

Teachers and STEM Ambassadors provided a number of suggestions of what was required to sustain the network.

- Providing case studies of successful use of STEM Ambassadors by schools
- Off-the-shelf activities that teachers and STEM Ambassadors can run in class
- Joint D&T and Science Department projects with STEM Ambassadors
- Lead Schools or STEMNET to plan and arrange an annual programme of network meetings
- Timetable STEM Ambassador visits and projects into the first half of the school year

12. Final Report Conclusion

Key findings for assessment of project impact
What outcomes does the evaluation suggest were achieved?

- The project has had a positive impact on the participating Lead and Network Schools, teachers and pupils, as evidenced by both qualitative and quantitative feedback. Outcomes reported so far are either in line with or have exceeded pre-project expectations. Teachers have advanced their approach to the principles of the new curriculum and are more confident in their subject knowledge and ability to extend and challenge pupils of all abilities.
- A number of aspects of the project have worked well. D&T teachers have enjoyed meeting together and sharing thoughts and practices and their stance toward changes in the subject curriculum.
- One of the key elements has been offering central training days for Lead teachers and the provision of a D&T consultant to advise and guide teachers through the potential benefits, changes and challenges of the new curriculum and what they need to think about and cater for in the future.
- STEM Ambassador assistance and co-delivery of activities has also proved very successful and our Lead teachers have continued to use STEM Ambassadors on a regular basis, either to repeat the activities undertaken as part of this project, or for support and insight with other curricular areas of lessons.
- Feedback shows us that teachers and pupils enjoyed their lessons or activities more with support and when using STEM Ambassadors, and this was also recognised by the Network schools. Where those taking part struggled was to form a network of schools, plan and stick to meetings and to then go on and communicate regularly without intervention of STEMENT. Part of the objectives of this project was to form self-sustaining networks, but we don't that this has happened and without more on-going support we do not have faith that a network would be sustained.
- The quantitative post-activity survey of Network and Lead School pupils also showed that the majority (4/5ths) of pupils found the activity enjoyable and taught them something they did not know before).

Pre and post-project surveys of Lead and Network School teachers showed increases in average scores for:

The pre and post-project surveys of Network School teachers showed increases in average scores for:

- Confidence in teaching D&T
- Confidence integrating people from the world of working into their teaching

While we were dealing with extremely small base sizes, the majority of Network and Lead Schools felt the activity to have been a success, and found the resources and support useful.

Key lessons learnt for assessment of project delivery

The work-load imposed by the project was a serious issue for some teachers

- "A lot to do in a short periods of time … there's got to be a better way of getting the paperwork done" Year 9 group teacher

- *What difficulties were encountered in delivery and how could they be mitigated in the future?*
- Lack of time to seek and engage with schools.
- If interested schools have been found, agreeing a convenient date and time when they could all attend a meeting has proved difficult.
- Even when two to three schools had been found, some dropped out at the last minute due to other schools commitment that had priority.
- Not all of those that attended joined their Network, even though all seemed to leave inspired and intending to join, on reflection some felt that they just couldn't commit – again due to work and time pressures.
- Spring term is a difficult time for some teachers with D&T coursework needing to be finished by half term, there are also coursework deadlines for A level students – this seems to be a reoccurring comment from our Lead teachers and potential Network schools.
- Many schools have had their budgets and GCSE offering reduced – which has resulted in them feeling reluctant to commit to anything out of their immediate plans.
- Many Network Schools have also had issues with staffing, and for some this is an on-going concern.
- In order to ensure sustainable communication between STEMNET and all Lead Schools - we again requested Lead teachers provide us with the contact details of at least two people within the school who we could engage with, one of whom should be a member of the school's Senior Leadership Team - but still we are finding that most teachers are leading this project alone.
- Network schools that were able to join Lead schools enjoyed sharing ideas and the idea of a sustainable network but without regular communication and structured forward planning (in the way that STEMNET administrated Phase 1) they fell away and go distracted from the network and completing their activities. It might have been more effective if STEMNET intervened at this point and offer to take of the network administration to improve communication and momentum in the early stages.
- Lead schools, leading and assisting Network schools worked to point but was not regular enough

The above aside, those that have attended a Network meeting, the post meeting feedback forms indicate their enthusiasm and that they value the project. However, STEMNET has concerns about

the potential size of a Network for some schools and also how sustainable each Network will be without a third party helping to maintain momentum.