

External Evaluation of the ENTHUSE Partnership Programme (EPP)

Final Report

Centre for the Use of Research and Evidence
in Education (CUREE)

June 2017

Contents

Executive Summary	4
ENTHUSE Partnership Programme overview	4
Evaluation overview and aims	4
Main findings.....	4
Introduction	9
Aims and purpose of evaluation	9
Relevant background information.....	9
Evaluation scope and methods	10
Impact on pupil outcomes	12
Section overview.....	12
Reducing achievement gaps between underachieving groups and other pupils	13
Understanding of the value and applicability of STEM subjects for careers and development of employability and practical skills	14
Engagement and enjoyment of STEM subjects.....	14
Impact on STEM teaching and leadership.....	15
Section overview.....	15
Changes to teaching practice.....	16
Understanding the value of STEM subjects.....	16
Development of leadership in STEM subjects	17
Impact on school partnerships	18
Section overview.....	18
Links with schools	19
Links with business, industry and the local community.....	20
Engagement with STEM experts.....	21
Funding and sustainability.....	22
Conclusions	23
Conclusion	23
Appendix.....	25
Case Study: Churchend Partnership.....	28
Context	28
Impact on Pupils	29
Ongoing and Future Plans and Aspirations	32
Case Study: Mary Elton Group.....	33
Background.....	33
Context	34
Impact on pupils.....	34
Impact on teachers.....	36
Impact on partnership schools.....	36
Key successes	37
Ongoing and future plans and aspirations	37
Evaluation of the ENTHUSE Partnership programme (2014-17)	38

Case Study: Woodford Halse iMAT Partnership	38
Background.....	38
Context	38
Impact on pupils	39
Impact on Teachers	40
Impact on Partnership Schools.....	40
Key Successes	41
Ongoing and Future Plans and Aspirations	41

Executive Summary

ENTHUSE Partnership Programme overview

ENTHUSE Partnerships are groups of between four and eight schools and/or colleges located in England. These groups can apply for a bursary of up to £12,000 and can use this money to work together to address local issues of underachievement in science, technology, engineering and/or mathematics (STEM) subjects. ENTHUSE Partnerships aim to support collaborative activities over two years to develop and strengthen local partnerships which can subsequently continue independently.

<https://www.stem.org.uk/project-enthuse>

The ENTHUSE Partnership Programme accepted its first cohort in 2014. It was based on the prior ENTHUSE Cluster programme¹. With the first 5 EPP cohorts, starting between September 2014 and September 2016, the programme has supported 248 schools (201 primary, 47 secondary).

Evaluation overview and aims

In March 2017, STEM Learning commissioned the **Centre for the Use of Research and Evidence in Education (CUREE)** to evaluate the impact of the ENTHUSE Partnership Programme (EPP). The evaluation looked across 5 cohorts of partnerships starting from 2014 to 2017 and therefore considered partnerships whose funding period ended in the previous school year ranging to cohorts still in their first year of the award. Many of the 248 schools involved are primary schools (201 compared to 47 secondary schools). While most findings apply to both phases, several differences in impacts and approaches between primary and secondary phases are identified throughout the report.

The evaluation examined **programme data**, arising naturally from the programme such as action planning and reporting documents, and **primary evaluation data**, collected for the evaluation which included **162 surveys** completed by teachers, school leaders and ENTHUSE Partnership leaders; **17 interviews** totalling over 300minutes and data arising from **case study site visits** including notes from conversations with children and adults at the schools.

This report synthesises the programme data with the primary evaluation data to **evaluate the impact of the EPP against its aims**. Data are triangulated against each aim to assess the impact of the programme in each area. The report ends with **recommendations** for improvements for the delivery and management of the programme.

Main findings

1. Impact on pupil outcomes

Our evidence suggests a positive impact of the programme on pupil outcomes, both in terms of academic attainment but especially in relation to pupil engagement and enjoyment of STEM subjects, particularly in science. Many colleagues reported that pupil understanding of the value and applicability of STEM subjects for careers had increased at both primary and secondary level.

- 96% of school leaders and 84.1% of teachers surveyed agreed that the EPP had a positive impact on their pupils' attainment in STEM subjects.

¹ see for further details: <https://www.stem.org.uk/elibrary/resource/45012>

- Analysis of available pupil data also indicates a positive impact on attainment, consistent with the feedback from surveys, interviews and our site visits. The impact on primary pupil achievement across cohort 1-4 was positive with an average of about 1 in every 5 pupils moving up one category per year (between 'below', 'at' or 'above' national expectations).²
- Primary pupils eligible for Free School Meals (FSM) increased their attainment relative to national expectations in science across two years in all three cohorts, where data were available. Moreover, there were indications that FSM pupils made greater rates of progress, with 1 in 4 pupils in cohorts 2 and 4 moving up a category in a year and pupils with FSM in cohort 3 improving in line with pupils overall.
- 100% of school leaders and 90% of teachers surveyed said that the EPP had a positive impact on pupils' interest and/or enjoyment of STEM subjects. 95.5% of leaders and 90% of teachers said that their pupils enjoyed and engaged with STEM projects or activities as part of the EPP. Pupils are more enthusiastic about STEM subjects more generally, particularly science, due to a more practical and engaging approach to teaching, indicating that improvements in interest and enjoyment are being built by both improvements in teaching and by collaborative partnership activities such as competitions, projects and events.
- 52.4% of school leaders and 56.1% of teachers surveyed agreed that pupils were more aware of possible career paths from studying STEM subjects. 68% of leaders and 58% of teachers agreed that pupils' understanding of the value of STEM subjects in business and industry had improved.

2. Impact on teaching and leadership in STEM subjects

All sources of evidence examined during the evaluation indicated positive and sometimes large impacts on teaching practice. There is strong evidence that staff have engaged with STEM CPD and found it to be both worthwhile and of a high standard. A particularly strong area of development was the teaching of practical, enquiry-based science and the confidence, ideas and skills to do so. Improvements were also commonly reported around forming cross-curricular links with science, and especially for developing maths through science.

- The impact of the Partnership Programme on staff subject and pedagogical knowledge was very positive. Improvements in staff subject and pedagogical knowledge were reported by 100% of school leaders and 83% of teachers surveyed.
- 77.4% of teachers reported improvements in their own teaching of STEM subjects and 100% of school leaders reported improvements in the teaching of STEM subject at their school. The most commonly raised area of improvement at primary level was a shift towards fostering rich scientific enquiry and a more practical approach to science.
- 86% of the teachers surveyed and 88% of leaders agreed that their personal and schools' professional development needs were being met by the programme. 100% of leaders thought that teaching in their school had improved as a result of the EPP. 84% of teachers and leaders that have been involved in CPD believed it to have been of a high standard.
- 92% of Partnership leaders thought that leadership in STEM subjects had improved because of the EPP. Interviewees and colleagues who spoke to CUREE during school visits described partnership activities such as joint planning, training and assessment as being highly developmental for their leadership role and skills.

²This estimate comes from the available pupil data submitted by partnerships. This figure should be treated with caution, however, as many schools and cohorts had incomplete data and the overall figure for cohort 3 was not in line with the other cohorts.

- Ideas and resources acquired through CPD and shared throughout the partnerships were key to developing teacher confidence and a practical, engaging approach to learning in STEM subjects.
- In the survey, 81% of school leaders and 79.1% of teachers agreed that their understanding of how to embed information and ideas about STEM in the curriculum had improved.
- 72.9% of teachers surveyed agreed that their awareness of effective STEM teaching resources had increased. 50% and 52.9% of leaders and teachers respectively agreed that their understanding of the application of STEM subjects in business and industry had improved.
- There has also been a positive impact on career development and enthusiasm, especially for partnership leaders. 58% of teachers agreed that the EPP had helped inspire them to stay in teaching and/or progress in their career. Partnership leaders reported that the EPP has helped develop their career (81% agreed) and increased their interest and enthusiasm for teaching STEM subjects and/or staying in teaching (82% agreed).

3. Impact on school partnerships

Colleagues overwhelmingly see the value of the EPP and reported many positive impacts on their school. School leadership and science coordinators were often grateful for being able to engage with the programme and nearly all (96% of leaders) would recommend the programme to other schools. A large number and wide variety of collaborative CPD activities have taken place funded by, within and because of the EPP. The vast majority (92%) of partnerships are seeking or have established business links. Partnerships are using funding efficiently to combine internal and external expertise, for example by sending individuals to training and then using cascading models to share ideas. The EPP is also supporting pupil experiences and activities (such as participating in joint projects, trips and visits).

- 71.4% of partnership leaders agreed that their partnership would not have been possible without the support and structure provided as part of the EPP and 87.8% thought that it would not have been possible without the award funding. The support, structure and especially the funding provided as part of the EPP were widely seen by EPP leaders as essential to its success.
- Interviews and site visits frequently discussed the impact of the EPP on raising the profile of science to make it 'part of the identity' of schools and how this has been visible to pupils and parents.
- According to the programme data, the vast majority (92%) of partnerships are seeking or have already established business links. 65.3% of partnership leaders agreed that the amount of collaboration with other non-school organisations had increased due to their involvement in the EPP.
- 59% of partnership leads think that it has been easy to engage with external STEM partners, and 45% of teachers had been involved with more STEM professionals from outside of school settings. Links with industry were more commonly reported at secondary level where pupils and teachers have had placements. The findings also show that industry and STEM links were being recognised as a way to motivate children and build an awareness of possible STEM careers.
- 91.8% of partnership leaders and 89.3% of school leaders reported increased involvement in collaborative work with other schools within the partnership as a result of the EPP. The corresponding figure for teachers was 65.8%. A common point with the feedback was that it was beneficial to go into other schools and see what they had done and especially to observe science lessons; teachers could then implement ideas having seen them executed and had access to support in order to do so. Many schools reported creating links and sharing benefits

to schools outside of their core partnership by 'reaching out' with projects, events and further training opportunities.

- The impact of engagement with STEM experts was broadly positive, with 72% of schools leaders and 74.3% of teachers reporting the opportunity to engage with STEM CPD experts, such as STEM Ambassadors, trainers or coaches.
- Around half of the partnerships explicitly positioned Science Learning Partnerships as a key partner. Drawing on external expertise varied according to partnerships' needs. One case study school for example reported how, having now completed the funding period and given the strength of expertise across the partnership, they were able to rely almost exclusively on internal expertise. Another approach to engaging with STEM experts taken by partnerships has been to link with STEM Ambassadors and members of the local community, especially but not exclusively parents.

4. The interim and longer-term impact of schools' engagement with the programme

In terms of sustainability, partnerships were found to be highly resilient to changes in personnel and challenges around staff turnover even created opportunities for further leadership development. Partnerships have created sustainable models of partnership operation and have had some successes in sourcing alternative sources of funding which can sustain the partnership activities following the end of the award funding, often at a similar or greater level of activity.

- 74% of partnership leaders agree that their 'partnership's activities and impact would be maintained if [they] or other key personnel were to leave (excepting short-term impacts of transition)'. 71% of partnership leaders thought that their partnership is/would be sustainable at a similar or greater level of activity now/after the funding period has ended.
- The nature of leadership and activities in the EPP has meant that partnerships have been remarkably resilient to changes in key partnership and school personnel.
- One key factor of sustainability discussed during interviews and site visits was securing buy-in and funding from head teachers and from parents. Success of partnership activities and the increased profile of science within the school helped sometimes initially less committed head teachers to see the value in investing in science and committing a portion of school budgets to match or replace the EPP funding in successive years.
- Partnerships have been able to secure a range of funding including sponsorship and donations from businesses, financial commitments from schools to support future partnership activities, funding from parents for afterschool clubs and for trips and funds raised from training other schools outside the partnership.
- 94% of partnership leaders thought that the EPP will have a lasting beneficial impact on pupils across the partnership. There are also several indications that there will be a longer-term impact on pupils' attainment such as increases in pupil attainment, strongly positive reports about improvements in pupil engagement, and evidence about fundamental changes in the culture, particularly in primary science.

5. Recommendations

One aim of the present evaluation was to consider possible improvements for the delivery and management of the programme. The following recommendations were made:

- Consider streamlining the collection and collation of pupils' achievement data to support school and partnership leaders in coordinating the collection of the data from across the partnership. Increased support, guidance and training for school and partnership leaders may also address this issue.

- Adapt the reporting model to include pupil outcomes across STEM subjects in terms of achievement and consider whether and how the impact on wider pupil outcomes can be assessed.
- Develop further support and guidance for building links with industry which identifies suitable opportunities and direct provision of a range of ideas, contacts and opportunities.
- Continue to monitor and conduct research into longer term impacts on student attainment, progression and attitudes to STEM subjects.

Introduction

Aims and purpose of evaluation

The ENTHUSE Partnership programme (EPP) has several aims, all of which are in line with the overall STEM Learning model of change³ and their vision to achieve a world-leading STEM education for all young people across the UK.

Table 1 - Aims of the ENTHUSE Partnership Programme

Aim 1	Improve Pupil outcomes - improvements in STEM learning and pupil outcomes which facilitate the closure of achievement gaps and improve the likelihood of progression in STEM for underachieving groups
Aim 2	Improve teaching and leadership in STEM subjects - through effective professional development and learning, sharing of good practice and subject-specific CPD.
Aim 3	Foster sustainable and effective partnerships - enabling groups of schools to work collaboratively in sustainable partnerships focused on improving leading, teaching and learning in science or other STEM subjects

Further details of what these entail are given in associated sections in this evaluation report, which is organised using these three key aims. In each of the three central sections, evidence collected during the evaluation and arising naturally from the programme planning and monitoring tools is triangulated to evaluate the impact of the EPP against each of its aims. The final section draws overall conclusions and considers how the management, delivery and impact of the EPP can be improved.

Relevant background information

ENTHUSE Partnerships are groups of between four and eight schools and/or colleges located in England. These groups can apply for a bursary of up to £12,000 and can use this money to work together to address local issues of underachievement in science, technology, engineering and/or mathematics (STEM) subjects. ENTHUSE Partnerships aim to support collaborative activities over two years to develop and strengthen local partnerships which can subsequently continue independently.

<https://www.stem.org.uk/project-enthuse>

The ENTHUSE Partnership Programme accepted its first cohort in 2014. It was based on the prior ENTHUSE Cluster programme⁴. With the first 5 EPP cohorts, starting between September 2014 and September 2016, the programme has supported 248 schools (201 primary, 47 secondary). Primary schools make up the majority of partnered schools (81%), this is in line with the proportion of primary schools in wider education system (86%). The EPP uses a flexible model which has enabled a diverse range of school partnerships in different areas with different aims:

- Partnerships have both structure and autonomy enabling them to address the specific development aims of partnership schools and to focus on specific pupil groups
- The vast majority of partnerships (34 out of 37) plan to or have already established links with STEM business and industry individuals or organisations.

³ <https://www.stem.org.uk/model-change>

⁴ see for further details: <https://www.stem.org.uk/elibrary/resource/45012>

- Of 37 partnerships, 23 include both a primary and secondary schools. Of these, 17 have a single secondary partner, 4 have two secondary partners and two have 2 or more. There are 12 primary only partnerships and 2 secondary only partnerships, the latter being both being in cohort 5. 35 out of 37 have a stated aim of or report having successfully set up primary secondary links (in the case of primary-only partnerships, with secondary schools outside of the named partnership schools).
- Most partnerships focus specifically on science. There are, however, examples of activities and aims focused on numeracy, engineering and/or technology and many partnerships, including two of the three evaluation case study partnerships, who report developing the links between numeracy and science.

Evaluation scope and methods

In March 2017, STEM Learning commissioned the **Centre for the Use of Research and Evidence in Education (CUREE)** to evaluate the impact of the ENTHUSE Partnership Programme (EPP). The evaluation looked across 5 cohorts of partnerships from 2014 to 2017 and therefore considered partnerships whose funding period ended in the previous school year ranging to cohorts still in their first year of the award.

The evaluation took **programme data** arising naturally from the programme as a starting point. Sources for programme data were the initial partnership action plans; pupil attainment data trackers; quantitative partnership reports which tracked partnership CPD activities; qualitative partnership reports which recorded success against partnership aims as set out in the action plans; and a sample of evaluation forms and post-CPD action plans arising from the partnership CPD activities.

The evaluation then collected **primary evaluation data**. Sources for primary data included the following:

- **162 surveys** completed by teachers (n = 82), school leaders (n = 29) and partnership leaders (n = 51). In many cases there was overlap between these roles. ENTHUSE partnership leaders, for example, were typically also teachers and school science co-ordinators and in some cases were senior leaders. Surveys were distributed by partnership leaders and via a list of contacts provided to CUREE. There were three surveys and respondents self-selected the most appropriate survey according to the nature and level of involvement in the partnership. The survey had a mix of scale response items (see Appendix 1) and open-response questions. We had stronger response rates from more recent cohorts and were able to get feedback from 35 out of 37 partnerships. Surveys were sent to partnership leaders who were asked to pass these on to leaders and teachers in their schools and partnerships. Response rates from partnership leaders was very high, moderate from leaders and teachers. Teachers tended to be co-ordinators of STEM subjects so evidence on the impact on other staff members is often indirect, as reported by school leaders and STEM subject co-ordinators. The two partnerships we did not receive any surveys for were both in Cohort 1. We also received higher rates of response from the three case study partnerships (from cohorts 1, 3 and 5).
- **17 interviews** totalling over 300 minutes, primarily with practitioners in partnership schools and especially science co-ordinators but also with STEM experts involved with partnerships. These interviews were tailored using semi-structured interview schedules to be appropriate for each respondent's partnership involvement and the context of their partnership. We targeted the interviews to ensure we spoke to colleagues across all phases, cohorts and levels of

involvement with the programme. As with the surveys, response rates were stronger in cohorts 3 to 5.

- Data arising from **case study site visits** including notes from conversations with children and adults at the schools, photos of practical science activities and pupil 'voice' notes where classes of children shared their views on post-its. In each site visit, a CUREE researcher was generously supported by the partnership leader and school scienceco-ordinators.

Impact on pupil outcomes

Section overview

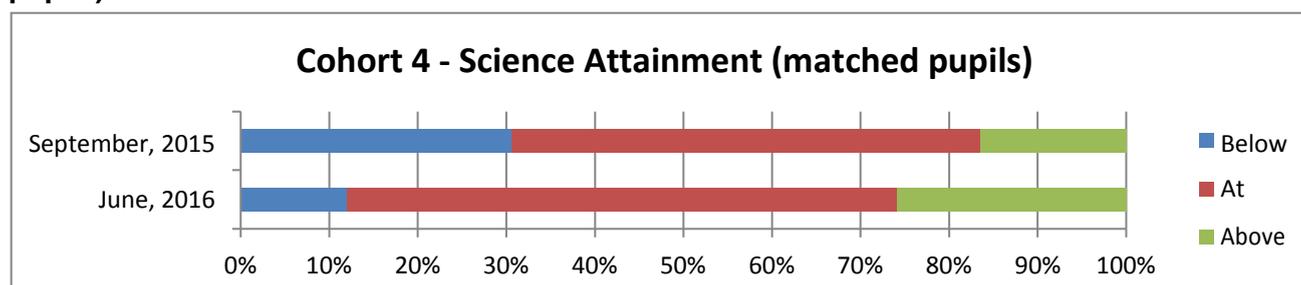
ENTHUSE Partnership Programme aim 1
Improve pupil outcomes - Improvements in STEM learning and pupil outcomes in particular for underachieving groups This includes: <ul style="list-style-type: none">✓ Achievement in STEM Subjects✓ Reducing achievement gaps between underachieving groups and other pupils✓ Understanding of the value and applicability of STEM subjects for careers and development of employability and practical skills✓ Engagement and enjoyment of science

Achievement in STEM subjects

96% of school leaders and 84.1% of teachers surveyed agreed that the EPP had a positive impact on their pupils' attainment in STEM subjects. Analysis of available pupil data also indicates a positive impact on attainment, consistent with the feedback from surveys, interviews and our site visits. The impact on primary pupil achievement across cohort 1-4 was positive with an average of about 1 in every 5 pupils moving up one category per year (between 'below', 'at' or 'above' national expectations).

Our analysis of the available attainment data for primary science in cohorts 1 to 4 (secondary-level data from Cohort 5 were not available for this evaluation) generally supported other sources of evidence indicating improvements in pupil attainment and allowed us to estimate its magnitude. As part of the EPP monitoring and assessment requirements, schools submitted pupil data to partnership leaders, who then collated the data for their partnerships. Whether pupils were a) working below, b) working at or c) working above national age-related expectations was recorded. We found a similar increase in pupil attainment for cohorts 1, 2 and 4. On average, about 1 in every 5 pupils moved up one category per year. For example, in cohort 4 over 85% of pupils were either at or above the national target grade from STEM subjects in June 2016. This is an increase of over 10% from the previous year in that cohort.

Figure 1 – Typical improvement in primary pupil attainment - Cohort 4 (n = 1220 matched pupils)



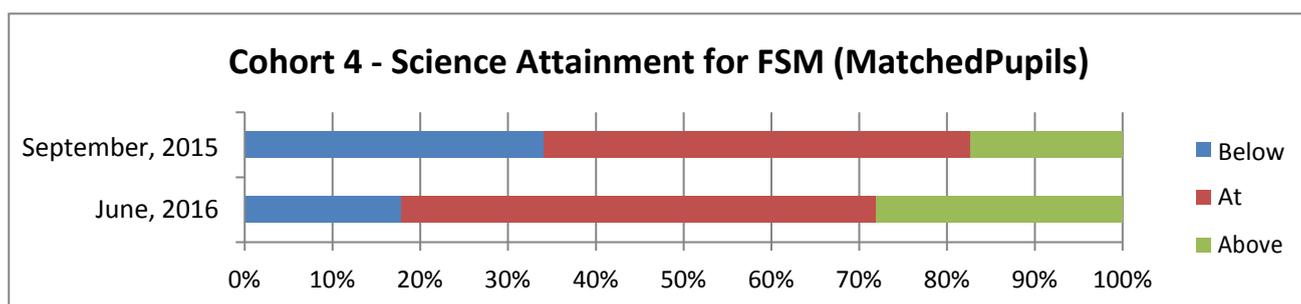
The data for Cohort 3, however, suggested no increase for pupils overall but an increase for pupils eligible for free school meals (FSM, an indicator of disadvantage) in line with that in previous years. The lack of an overall increase may be due to reliability and coverage issues with the data. Data collection in this year coincided with the national curriculum levels being replaced with a new grading system across the English education system and there were ENTHUSE programme data missing or poorly recorded for many schools in all cohorts in this year. This problem was especially

acute in cohort 3 where out of 3,000 pupils for whom we had 2015 data, only 816 could be matched to a corresponding 2016 result. Further inspection showed that gains in this cohort were offset by a downwards adjustment in assessment standards in one partnership. The partnership leader reported that schools had needed a lot of support assessing against national expectations and would have benefitted from more guidance and training in this area, something which has subsequently been provided to future cohorts.

Reducing achievement gaps between underachieving groups and other pupils

Pupils on FSM increased their attainment grades in STEM subjects across two years in all three cohorts for which we had data. Moreover, there were indications that FSM pupils made greater rates of progress than their peers, with 1 in 4 pupils in Cohorts 2 and 4 moving up a category (see last section) in a year and pupils with FSM in cohort 3 improving in line with pupils overall.

Figure 2– Typical improvement in attainment of pupils on FSM - Cohort 4 (n = 185 matched pupils)



The ENTHUSE action planning allows schools to identify particular groups of pupil to target so that context-specific achievement gaps can be reduced (see table, below right, for an overview of partnership foci). Interviewees have discussed the ways in which they have targeted specific groups of pupils, engaging them in specific activities tailored to narrowing the gap. For example, Churchend School have focused on high attaining girls, as assessments showed they had fallen behind high attaining boys by year 6 and pupil premium children.

Another example is Ambergate Special School, who aimed to keep the focus on practical aspects for SEN students, and were able to implement specific activities for different pupils appropriate to their development, arranging outdoor activities or encouraging independent play. They were also able to adapt early years provision (such as working with textures, fruits etc.) to meet pupil needs. In an interview, a school leader commented that she had benefitted from a project leader encouraging her to make links with SEN schools outside of the partnership, to see how they “do science”.

Partnership focus on narrowing the gap	Number of schools
High attaining (total)	14
High attaining girls	6
Low attainment	23
EAL	17
Ethnic minority girls	4
Attainment gap (total)	46
Careers	9
Early Years	6
Girls attainment gap	14
Pupil premium (total)	122
Pupil premium girls	11
Working scientifically in primary	7

Understanding of the value and applicability of STEM subjects for careers and development of employability and practical skills

The impact on pupils' understanding of the value and applicability of STEM subjects for careers have been positive, although this area was less strong than other areas in terms of impact. In the survey, 52.4% of school leaders and 56.1% of teachers agreed that pupils were more aware of possible career paths from studying STEM subjects. When asked if pupils' understanding of the value of STEM subjects in business and industry had improved, 68% of leaders and 58% of teachers agreed.

Surveys, interviews and case study visits provide many examples of developing understanding of career, business and industry links at both primary and secondary level. For example, one teacher describes both primary and secondary pupils visiting building sites and Liverpool docks, to see 'real-life' examples of how STEM applies in industry; a secondary head of KS3 maths reported plans for pupils to go on STEM-based work placements, to make them 'more aware of how classroom-based activities are linked with real life applications'. The Churchend case study partnership set up an opportunity for pupils to meet STEM Ambassadors from a range of STEM backgrounds including electronics, computing, chemical engineering, chemistry in a 'speed dating' session format. Pupils spoke to each ambassador about the link between STEM subjects and their career. Ambassadors also spoke about their own school experiences in STEM subjects and school more generally to help the children see that they too can pursue STEM careers. During site visits, children frequently mentioned the visitors they had had, from electricians and engineers to dentists and chemists, who had enthused them and helped them see the value of science for careers. A focus group of children at the Mary Elton case study were able to name a large range of science careers, although they thought it too early to commit to one.

Engagement and enjoyment of STEM subjects

The impact on pupil engagement and enjoyment of science was very positive. In the survey, 100% of school leaders and 89.9% of teachers agreed that the EPP had a positive impact on pupils' interest and/or enjoyment of STEM subjects. 95.5% and 89.9% of leaders and teachers respectively said that their pupils had enjoyed and engaged with STEM projects or activities as part of the EPP.

Many schools have reported increased pupil-pupil collaboration both in the classroom, at events and across schools. Examples of this can be seen through the activities of Churchend School. The school targeted high attaining girls and gave them the opportunity to lead and instruct other pupils, which helped them to gain confidence and led to improved attainment. Pupil premium groups from each of the five schools designed and presented experiments to groups from other schools, through which they were able to exchange ideas and teach one another. Finally, every other year, pupils from years 4 to 6 would attend a day in secondary schools where they ran experiments. Initially, the year 4s reported being more nervous and not as engaged; however, the second time they went, the pupils were much more confident and able to lead and instruct the younger pupils.

"The children are interacting more with one another to test their own hypotheses and communicate more enthusiastically about science with a greater depth of vocabulary along with a passion to reason and explore in a safe and secure manner. In Reception children were not only questioning one another but also the teacher which was amazing to witness."

Reception Class Teacher – Cohort 5

Impact on STEM teaching and leadership

Section overview

ENTHUSE Partnership Programme aim 2	
Improve teaching and leadership in STEM subjects - through effective professional development and learning, sharing of good practice and subject-specific CPD.	
This includes:	
✓	Staff subject knowledge and pedagogical knowledge
✓	Changes to their teaching practice
✓	Staff understanding of STEM subjects' value in business and industry
✓	Development of leadership in STEM subjects

Staff subject and pedagogical knowledge

The impact of the Partnership Programme on staff subject and pedagogical knowledge has been very positive. Improvements in staff subject and pedagogical knowledge were reported by 100% of school leaders and 83% of teachers surveyed. A partner lead commented that the programme 'furthered [my] own subject knowledge' adding that it was 'great to see more people enjoying teaching science - [it has] boosted my job satisfaction'.

At the outset of the award, many primary teachers had had little or no training in science and reported CPD making an especial difference to them. Secondary colleagues also reported improvements in subject knowledge. Given the higher baseline level of STEM subject knowledge at secondary, interviewees spoke about the value of observing or being trained by or observing outstanding teachers and specialist leaders of education (SLEs). At primary level, core subject knowledge, observing partnership colleagues and practical teaching ideas were more commonly emphasised.

The evidence from interviews and case studies showed similarly positive results and suggests the benefits were diverse and widely shared. At one case study school for example, teachers and support staff had been using ReachOut CPD⁵, an online platform which refreshes and builds understanding of key areas of the primary curriculum. The need for staff, and in particular support staff, to enhance their scientific knowledge and vocabulary was identified during a partnership staff skills audit and the idea of using ReachOut was raised in partnership meetings to address this.

An area where teachers had developed their subject and pedagogical knowledge raised in many interviews and across the site visits was in understanding cross-curricular links and their value. Teachers and leaders reported being involved in curricular planning sessions to identify links between science and the numeracy and literacy curricula. Representatives from the Woodforde Halse iMAT case study partnership attended an external workshop from STEM Learning focused on Improving Numeracy through science and the rich links between science, design and mathematics were evident in children's work across the partnership. At primary, there have also been innovative links made across the curriculum such as an experiment to mummify a tomato while studying the Egyptians, studying heart rate and nutrition science as part of physical education and using the story of the gingerbread man to learn about materials and build bridges for him.

⁵ <http://www.reachoutcpd.com/>

Changes to teaching practice

Another area where the data shows a positive impact is on teaching practice. 77.4% of teachers and 100% of school leaders surveyed reported improvements in the teaching of STEM subjects. The most commonly raised area of improvement at primary level was a shift towards fostering rich scientific enquiry and a more practical approach to science.

“I feel as a whole staff we are more passionate about the subject which is now shown prominence across the whole school through displays and work books.”

Teacher - Cohort 5

There was a clear and strong link between what teachers reported as being valuable in CPD activities they attended and this aspect of their teaching practice. According to CPD evaluation forms, the strongest aspects of the CPD that teachers had been involved in were practical examples of experiments and ‘hands on’ activities that they could do in their class. Practical activities and ideas resources, coupled with partnership working gave many teachers the confidence to move from a more prescriptive approach where teaching was heavily reliant on presentations and videos to pupil-led enquiry supported by engaging ‘starter’ activities, rich resources and stimulus materials and confidence of the teacher in their subject knowledge to draw children’s attention to the key scientific concepts and vocabulary. 72.9% of teachers we surveyed agreed that their awareness of effective STEM teaching resources had increased. Across many interviews, surveys and conversations during visits, the supporting factors underpinning a more enquiry-based approach were introducing teachers to practical activities and resources which then gave them the confidence to facilitate practical work which enables children to ask and investigate their own questions.

Secondary colleagues tended to highlight the value in getting new ideas for activities and resources and the improvements this had on their teaching. So while such fundamental changes in teaching were less apparent for secondary level teaching, teachers and leaders reported improvements in teaching (see section below for further information on primary-secondary links and the benefits of this).

Understanding the value of STEM subjects

The project has shown some significant progress in enabling teachers to understand how STEM subjects link with business and industry, and how to contextualise cutting-edge STEM knowledge and employability skills into the curriculum. In the survey, 81% of school leaders and 79.1% of teachers agreed that their understanding of how to embed information and ideas about STEM in the curriculum has improved. 50% and 52.9% of leaders and teachers respectively agreed that their understanding of the application of STEM subjects in business and industry has improved. This figure might reflect the fact that many teachers we spoke to were more focused on helping pupils see the applicability and value of science in the world and community rather than for careers and business or industry *per se*. Primary colleagues were establishing links and visits to achieve this broader aim as opposed to their own understanding of the applicability of STEM subjects being a high development priority for them personally. Secondary colleagues tended to be far more focused on industry and business links. One cohort 5 partnership organised a teacher professional development visit to Kier, a construction group, to develop teacher understanding in this area.

Development of leadership in STEM subjects

A variety of positive approaches to the development of leadership in STEM subjects were reported in the surveys, interviews and during site visits. 91.8% of partnership leaders agreed that the EPP had contributed to improvement in the leadership of STEM subjects across the partnership and 84.8% reported that it had improved their own leadership. Leadership activities such as assessment, curricular and partnership planning, policy development, skills auditing and holding cross-partnership and within-school training were all raised as key activities through which science co-ordinators and partnership leaders were able to develop their leadership role. There has also been a positive impact on career development and enthusiasm, especially for partnership leaders. 58% of teachers agreed that the EPP had helped inspire them to stay in teaching and/or progress in their career. Partnership leaders reported that the EPP has helped develop their career (81% agreed) and increased their interest and enthusiasm for teaching STEM subjects and/or staying in teaching (82% agreed).

It came across strongly in the interviews that many science coordinators were often new to the role, and it was commonly identified that taking part in the assessment processes helped them to identify areas to improve and focus on. Attending network meetings or training, and subsequently delivering feedback to their staff, was also a valuable process for developing leadership skills. It is worth noting in relation to training that many colleagues commented that they had only limited funds and time to send people on courses, and so would be selective and in some cases rotate who attended, generally choosing from one or more of the school science co-ordinators. This constraint was often raised as a positive in relation to leadership: many partnerships would look to 'cascade' the learning from courses to other co-ordinators in other schools and in whole-staff training sessions within their own schools to share the benefits as widely as possible. So as well as making efficient use of funding, this strategy became vehicle for the development of leadership. This approach to cascading learning was reported by both primary and secondary colleagues.

One secondary science co-ordinator who we spoke to emphasised the value of observing an outstanding science teacher and how she was able to pass on ideas for activities and teaching styles to other colleagues. One survey respondent reported that 'one of my teachers has been asked to deliver science training to other schools as a result of his participation in the project and another has attended STEM training in York, which has been a very useful networking exercise and enabled her to hear from experts'. Overall, interviews reported that the process made them look at how science worked across the school and that they thought about science differently as a result. One partner lead stated: "I have become a confident leader who has a clear vision for my subject and how I want to develop it."

Impact on school partnerships

Section overview

ENTHUSE Partnership Programme aim 3
<p>Foster sustainable and effective partnerships - enabling groups of schools to work collaboratively in sustainable partnerships on focused on improving leading, teaching and learning in science or other STEM subjects</p> <p>This includes:</p> <ul style="list-style-type: none">✓ Joint CPD activities✓ Primary/secondary transition✓ Subject-specific CPD✓ Encouragement for partnerships to engage with local Science Learning Partnerships (SLPs) and other relevant STEM educational programmes operated by STEM Learning

Collaborative Continuing Professional Development and Learning (CPDL) activities

The EPP has had a strong positive impact on creating and developing sustainable and effective partnerships and on the amount and quality of opportunities for collaborative activities between staff and pupils across partnership schools and, in some cases, other nearby schools. The range of CPDL activities is given in table 2 (right), sorted from those most frequently mentioned on the programme CPD quantitative trackers to the least.

Teachers (85%) and leaders (88%) surveyed agreed that their personal and schools' professional development needs are being met by the programme. Similarly, 84% of teachers and leaders that have been involved in CPD believe it to have

been of a high standard. CPD activities were identified as the most useful part of the programme by both teachers and leaders. Feedback about the value of these CPDL activities has been largely positive across all evaluation data sources including the evaluation forms from directly after CPD events, discussions as part of case studies and interviews and the surveys.

Many opportunities to work in collaboration with other teachers have been afforded as part of the EPP and there has been a positive impact on the frequency and quality of STEM CPDL activities across the partnership. Many partnership collaborative activities (e.g. planning Science Week, conducting lesson studies or curricular planning) required science coordinators to work closely with

Table 2 – CPDL activities

Detailed plans and records kept by partnerships as part of the EPP indicate a wide range of CPD activities have taken place:

More frequent:

- network meetings
- facilitated resource or CPD development
- face to face: courses, tailored training, and group activities

Medium frequency:

- quality-assured, autonomously delivered peer-to-peer work between schools/colleges
- one-to-one advice, mentoring, coaching, tutoring
- teaching and learning diagnostic services
- conferences

Less frequent:

- online-captured asynchronous CPD
- online synchronous CPD activity
- tutoring for accreditation

one another. This shared expertise and created productive working relationships. One science co-ordinator commented that, 'The project has helped create a meaningful bond between school science leads, who can look to each other for support and advice'. Common interview feedback was that it was beneficial to go into other schools and see what they had done and especially to observe science lessons; teachers could then implement ideas having seen them executed and had access to support in order to do so. Often schools rotated the hosting of network meetings between different schools in a partnership. This work further enhanced the process of sharing ideas as coordinators could see the changes that other schools made from the planning stage through to completion. Colleagues also reported this rotation of networking and staff meetings as being an opportunity to examine and moderate work and discuss planning and assessment.

Links with schools

The EPP has greatly increased the number and quality of school to school partnerships. Many partnerships have looked to consolidate and extend pre-existing links and collaborative activity; some have looked to set up something entirely new. There are three distinct areas where the EPP has had an impact on school links: between partnership schools; with schools outside of the core partnership; and primary-secondary links with schools either within partnerships or with other nearby schools.

ENTHUSE Partnership school links

91.8% of partnership leaders and 89.3% of school leaders reported increased involvement in collaborative work with other schools within the partnership as a result of the EPP. The corresponding figure for teachers was 65.8%. This suggests that cross-partnership collaborative work tends to be more common for science leaders with many other colleagues being indirectly linked with other schools. A similar number of teachers (67.1%) agreed that they were doing more collaborative work with colleagues in their own school.

School links beyond the partnership

The EPP has enabled some links outside of the core partnership schools. Although the evaluation data does not allow a firm estimate of the proportion of schools linking with schools outside their partnership, it is important to note these routes for wider school links and shared benefits beyond the partnership schools. The established (cohort 1 and 3) case study schools provide two examples of schools who are 'reaching out' to schools beyond their core partnership. Mary Elton partnership collaboratively organised a science competition this year involving 17 schools which enabled 4000 children to access the projects for a cost of £1000, or 25p per child. They are also offering training to other schools in the region through a new online hub. Similarly, the Churchend partnership, with the lead school, Churchend Academy, being a teaching school, has been able to reach out to large numbers of schools with training and opportunities for collaboration.

Primary-secondary links

In the programme planning data 35 out of 37 (95%) of partnerships have a stated aim of or report having already successfully set up primary secondary links. Of these, 23 are mixed partnerships, so necessarily build primary-secondary links into the model and the remaining 12 aim to or have already established a link with a local primary/secondary school outside of the core partnership. The vast majority of primary-secondary link activities understandably focus on transition and year groups in upper primary or lower secondary.

Interviewees and survey respondents thought that the biggest benefit of primary-secondary links is for primary pupils and staff. By linking up with secondary schools, primary pupils have been able

to make use of better equipped facilities and labs and run activities that would not be possible inside of their own schools. Primary schools typically have low resources dedicated to science and poorer science facilities while secondary schools have dedicated science teachers who regularly run experiments and practical activities. Primary pupils are particularly excited when able to go into a secondary school to work in a science lab or put on a lab coat (in one case study primary school, children regularly wore lab coats and goggles as part of all of their science lessons and, in another, reception children were role playing being scientists using lab coats and other props such as magnifying glasses).

“One of the main benefits of the project for our school was the collaboration with the secondary school and the support they offered, both just through CPD, but also with running of science clubs and science immersion events”

Partnership Leader - Cohort 3

Secondary school colleagues with whom we spoke reported several benefits from having primary links. Mixed primary-secondary partnerships typically had a single secondary school which tended to play a more supportive role. The most common benefit relates to supporting pupils in feeder primary schools. Such links have had a positive impact on pupils and staff in both the primary and secondary schools involved. As one secondary science co-ordinator explained, the link had helped her and her staff understand pupils’ prior experience in science, enabled better planning of transition and the KS3 curriculum to address areas which are less of a focus at primary level. Similarly, one secondary maths co-ordinator expected their work with feeder primary schools to benefit them in future ‘as students who have received the input delivered in feeder schools arrive here and have a stronger understanding of maths’.

There were also benefits reported for pupils: another secondary maths co-ordinator reported that pupils at their school, after receiving training, had visited primary schools to act as mentors for younger pupils. Pupils in both phases benefitted greatly from this and the scheme is to be expanded next year.

Links with business, industry and the local community

65.3% of partnership leaders agreed that the amount of collaboration with other non-school organisations had increased due to their involvement in the EPP; the impact of links with business, industry and the local community can be seen in different ways across the partnerships. For example, there is one partnership helping to create a new science section for their local museum. One partner lead commented, ‘In developing further links to businesses, I am able to explore new opportunities and look to work with the partnership to look at further opportunities to develop ideas beyond the funding.’ According to the programme data, 34 out of 37 partnerships are seeking or have established business links.

The findings show that industry and STEM links were being recognised as a way to motivate children and build an awareness of possible STEM careers. For example one partnership took year 3 and 4 pupils to the Jaguar Land Rover plant in Birmingham, another took pupils to the Liverpool docks with the aims of seeing the value of STEM skills in the world around them. The importance of business and industry links was particularly emphasised by secondary colleagues who had or were arranging placements in industry for pupils and staff as well as visits. There are further examples of teachers trying to build the real world understanding through other means such as projects like “beat the flood⁶” where students had to work together on a design problem with a

⁶ <https://www.stem.org.uk/elibrary/resource/34167>

clear context. A secondary curriculum leader from this school reported that lower-achieving boys particularly benefitted from this.

59.2% of partnership leaders agreed that it was easy to engage with non-school partners. An interview with the leader of an education business partnership also revealed how they had taken a major role in the planning, and were organising a placement per term for either pupils or teachers. One such visit was to the site of a construction firm in the early stages of building a school. Through this, staff were able to get an idea of the role of science in the real world, and STEM careers which existed locally. Having built their understanding they could then feed this back to students. However, one thing this highlighted was that for these links with businesses to be maintained, teachers needed to be proactive.

Engagement with STEM experts

The impact of engagement with STEM experts was broadly positive with 72% of schools leaders and 74.3% of teachers reporting the opportunity to engage with STEM CPD experts, such as STEM Ambassadors, trainers or coaches, and the interim report demonstrated that partnerships are drawing on a wide range of available expertise. Lead schools tended to have considerable pre-existing expertise; teacher school alliances have substantial involvement in around a quarter of partnerships; and there are partnerships linking with 'critical friends' from higher education and local education authorities.

Around half of the partnerships explicitly positioned Science Learning Partnerships as a key partner. Drawing on external expertise varied according to partnerships' needs. One case study school for example reported how, having now completed the funding period and given the strength of expertise across the partnership, they were able to rely almost exclusively on internal expertise. Another approach to engaging with STEM experts taken by partnerships has been to link with STEM Ambassadors and members of the local community, especially but not exclusively parents. Our interview, survey and case study data are replete with examples of schools inviting STEM experts into schools to run demonstrations, judge competitions and train staff. The longstanding relationship with Benedict Whybrow and the Mary Elton Partnership (see case study) is one example of the different ways in which STEM Ambassadors and experts can support partnerships and the value in them doing so. There were examples of STEM Experts playing a strong role in the design and planning of partnerships and their CPDL activities. Esme Glauert, for example, is a Senior Lecturer in Primary Education at the Institute of Education, University College London. She supported the Gearies Partnership with designing and targeting effective CPDL and adapting the programme to their context to ensure professional learning is embedded in practice.

The EEP has deepened my connections with other schools and enabled me to develop and continue working with and learning from them. I have had fantastic CPD in the STEM centre and York which I have shared with my colleagues. I'm more skilled, confident and definitely much more passionate about science in primary schools.

Partnership Leader - Cohort 5

Funding and sustainability

The support, structure and especially the funding provided as part of the EPP were widely seen by EPP leaders as essential to its success. 71.4% of partnership leaders agreed that their partnership would not have been possible without the support and structure provided as part of the EPP and 87.8% thought that it would not have been possible without the award funding. At face value, this presents a challenge for sustainability; despite this, 71.4% of partnership leaders responding to our survey thought that their partnership is/will be sustainable at a similar or greater level of activity now/after the funding period has ended.

One key factor of sustainability discussed in our interviews and during site visits was securing buy-in and funding from headteachers and from parents. Success of partnership activities and the increased profile of science within the school helped, sometimes initially less committed, headteachers to see the value in investing in science and committing a portion of school budgets to match or replace the EPP funding in successive years. Similarly, in the Woodford Halse case study partnership, the more practical approach to science taken by teachers and engaging activities paid for by schools such as a visit from 'Atomic Tom' led to a 'buzz' around science in the school which was frequently commented on by parents. This led to a large surge in the number of parents paying for after-school science clubs. Partnerships also reported securing regular sources of funding and in kind support ranging from local supermarkets donating science resources, businesses sponsoring and supporting science projects and volunteers such as parents, member of the local community and students agreeing to visit and support school STEM subjects.

The other key factor discussed in relation to sustainability was succession planning and handover of responsibilities. Given wider challenges of retention and recruitment, some schools faced considerable changes in personnel, even over a two-year period. For example, one survey respondent reflected: 'The second year of this project has been challenging. Out of the 6 other schools I have been working with, four of them had a new Head start last September and there are also four new science Leads. These changes have meant that we have had to amend our plans and objectives which has been tricky.' Despite these challenges, the nature of leadership and activities in the EPP has meant that partnerships have been remarkably resilient to such changes. 74.3% of partnership leaders agree that their 'partnership's activities and impact would be maintained if [they] or other key personnel were to leave (excepting short-term impacts of transition)'. Interview and case study data also provide many examples of changes in personnel, which schools were able to cope with and often presented opportunities for further leadership development (see above).

Conclusions

Conclusion

Across the surveys, interviews and site visits the feedback from colleagues we have spoken has been highly positive. Teachers have observed that pupils are more enthusiastic and more engaged with science. Pupils have taken part in a wide range of science activities and there are many examples of pupils responding well to changes in teaching practice. There is strong evidence that staff have engaged with STEM CPD and found it to be both worthwhile and of a high standard. School leadership and science coordinators were often grateful for being able to engage with the programme and nearly all (96% of leaders) would recommend the programme to other schools. There is evidence of collaboration taking place between both the leadership and the teachers across schools in partnerships. This is particularly true of science coordinators who are commonly the key person for each partnership school engaging with the planning.

Partnerships have shown resilience against staffing changes and they look to be sustainable in terms of activity. There is evidence that changes to practice and planning are happening on a school level and that the cultures of the schools have changed in terms of collaboration and in adopting practical and engaging approaches to teaching STEM subjects. Therefore, the partnerships and the impacts on teaching practice in particular look to be largely sustainable. In some cases, partnerships have been challenged to make efficient use of funding and this has pushed them towards greater collaboration. Many partnerships have sourced ongoing funding via engaging with local business or asking for contributions from parents. Some have set aside additional school funding to ensure the partnerships continue.

One area where our evidence suggests the impact of the programme was less strong (but still positive) was in relation to careers and link to STEM business and industry individuals and organisations. This is likely to be reflective of the large proportion of primary schools in our sample and in distinctions between having formal links, visits and placements and more informal visits from scientists and STEM experts from the local community. It also seems to reflect that many partnership leaders reported the difficulties they had had in identifying and organising possible links. It is also worth noting that many of the secondary schools involved were involved in a more supporting role for activities related to transition. The benefits of the programme have therefore been larger for primary schools, although this report has described many benefits for secondary schools both in terms of teaching and learning and around the benefits of primary-secondary links. There are two secondary-only partnerships in cohort 5 and it will be valuable to track the progress of these, especially as pupil attainment and STEM subject take up data become available to be more confident that the benefits described in this report for primary schools and the smaller proportion of secondary schools apply to secondary schools more generally.

Colleagues overwhelmingly see the value of the EPP and report many positive impacts on their school. The following positive and detailed comment from our survey gives an indication of this overall conclusion:

Our membership of the EPP is undoubtedly having a very significant impact on the quality of Maths CPD and teaching in all three partner middle schools. EPP funding has assisted us to deploy a very effective Maths specialist SLE who has already led an impressive amount of CPD for maths teachers in our middle schools. This is having a particularly significant impact at KS2 where maths is often taught by non-specialists. Significant improvements in maths teaching and pupil outcomes have already been recognised (just 9 months into the project) and this was reflected in a recent Ofsted inspection of one of the middle schools.

Our Maths SLE has carried out lesson study-based CPD in Maths with teachers in all three partner middle schools. This has involved joint planning and implementation of new pedagogies in the classroom. Evaluations show that teachers' confidence has improved significantly, especially that of non-specialist Maths teachers at KS2.

Our experience of EPP so far has been overwhelmingly positive - it has already brought tremendous benefits to our partnership and its impact on our maths teachers and students in our middle schools has without doubt exceeded our expectations (and we have very high expectations!).

Assistant Headteacher – Cohort 5 Secondary School

Appendix

Appendix 1 – summary of all responses to survey scale items

Teachers' Survey (n = 82) – Scale Items Only	Disagree	Neutral	Agree
OVERALL			
I have benefitted from my involvement in the ENTHUSE Partnership programme (EPP)	3.9%	9.2%	86.8%
I would recommend the EPP to another group of schools	3.9%	11.8%	84.2%
The time I have spent on professional development and other activities within my partnership has been personally worthwhile	1.3%	13.2%	85.5%
I have been involved in more collaborative work with colleagues from my own school as a result of the EPP	11.8%	21.1%	67.1%
I have been involved in more collaborative work with colleagues from other schools in my partnership as a result of the EPP	18.4%	15.8%	65.8%
I have been involved in more collaborative activities with STEM professionals from a non-school setting as a result of the EPP	21.3%	33.3%	45.3%
PROFESSIONAL DEVELOPMENT			
My personal professional development needs and objectives have been met	0.0%	14.1%	85.9%
The EPP has contributed to improvements in my subject knowledge/pedagogical knowledge	7.0%	9.9%	83.1%
I have increased awareness of effective STEM teaching resources	5.7%	21.4%	72.9%
My teaching of STEM subjects has improved	3.0%	19.4%	77.6%
My understanding of how to embed information and ideas about STEM in the curriculum has improved	4.5%	16.4%	79.1%
My understanding of the application of STEM subjects in business and industry has improved	20.0%	27.1%	52.9%
I have had the opportunity to engage with STEM CPD experts (e.g. STEM Ambassadors, trainers or coaches).	10.0%	15.7%	74.3%
The STEM CPD that I have been involved in has been of a high standard	1.4%	14.3%	84.3%
Involvement in the EPP has helped inspire me to stay in teaching and/or progress in my career	10.4%	31.3%	58.2%
PUPIL IMPACT			
The EPP has had a positive impact on my pupils' attainment in STEM subjects	1.4%	14.5%	84.1%
The EPP has had a positive impact on my pupils' interest and/or enjoyment of STEM subjects	0.0%	10.1%	89.9%
My pupils have enjoyed and engaged with STEM projects/activities as part of the EPP	1.4%	8.7%	89.9%
The EPP has increased my pupils' understanding of the value of STEM subjects in business, science and industry	13.0%	29.0%	58.0%
The EPP has had/will have a lasting impact on my pupils	1.4%	18.8%	79.7%
As a result of the EPP, my pupils are more aware of possible career pathways from studying STEM subjects	9.1%	34.8%	56.1%

School Leaders' Survey (n = 29) – Scale Items Only	Disagree	Neutral	Agree
OVERALL			
My school has benefited from involvement in the ENTHUSE Partnership programme (EPP)	0.0%	0.0%	100%
I would recommend the EPP to another group of schools	0.0%	0.0%	100%
The time my colleagues at my school have spent on professional development and other activities within the partnership has been worthwhile	0.0%	3.6%	96.4%
Colleagues at my school have been involved in more collaborative work together as a result of the EPP	3.6%	7.1%	89.3%
Colleagues at my school have been involved in more collaborative work with other schools in my partnership as a result of the EPP	0.0%	10.7%	89.3%
Colleagues at my school have been involved in more collaborative activities with STEM professionals from a non-school setting as a result of the EPP	11.1%	40.7%	48.1%
PROFESSIONAL DEVELOPMENT			
The EPP has contributed to meeting my school's professional development needs and objectives	0.0%	12.0%	88.0%
Staff subject/pedagogical knowledge has improved	0.0%	0.0%	100%
Teaching of STEM subjects has improved	0.0%	0.0%	100%
Staff understanding of how to embed information and ideas about STEM in the curriculum has improved	0.0%	19.0%	81.0%
Staff understanding of the application of STEM subjects in business and industry has improved	8.3%	41.7%	50.0%
Colleagues at my school have had the opportunity to engage with STEM CPD experts (e.g. STEM Ambassadors, trainers or coaches).	12.0%	16.0%	72.0%
The STEM CPD that colleagues at my school have been involved in has been of a high standard	0.0%	16.0%	84.0%
PUPIL IMPACT			
The EPP has had a positive impact on pupil attainment in STEM subjects at my school	0.0%	4.0%	96.0%
The EPP has had a positive impact on pupils' interest and/or enjoyment of STEM subjects at my school	0.0%	0.0%	100%
Pupils at my school have enjoyed and engaged with STEM projects/activities as part of the EPP	0.0%	4.2%	95.8%
The EPP has increased my school's pupils' understanding of the value of STEM subjects in business, science and industry	4.0%	28.0%	68.0%
The EPP has had/will have a lasting impact on pupils at my school	0.0%	20.0%	80.0%
As a result of the EPP, pupils are more aware of possible career pathways from studying STEM subjects	0.0%	47.6%	52.4%

Partnership Leaders' Survey (n = 51) – Scale Items Only	Disagree	Neutral	Agree
OVERALL			
Involvement in the ENTHUSE Partnership programme (EPP) has been beneficial for the schools in my partnership	0.0%	4.1%	95.9%
The amount of collaboration taking place between schools and teachers in our partnership has increased due to the EPP	0.0%	8.2%	91.8%
The amount of collaboration with other non-school organisations (e.g. STEM business or organisations) has increased due to involvement in the EPP	6.1%	28.6%	65.3%
The EPP will have a lasting beneficial impact on pupils across the partnership	2.0%	4.1%	93.9%
The EPP has increased engagement with high-quality STEM professional development	2.0%	4.1%	93.9%
The EPP has increased the amount of professional learning and development taking place in between formal training events	2.0%	18.4%	79.6%
The EPP has contributed to improvements in teaching of STEM subjects	0.0%	6.1%	93.9%
The EPP has contributed to improvements in leadership of STEM subjects	0.0%	8.2%	91.8%
The EPP has led to improvements in staff understanding of the application of STEM subjects in business and industry	6.1%	24.5%	69.4%
The benefits to teachers and leaders of being in the EPP have been shared widely	4.2%	14.6%	81.3%
The benefits to pupils of being in the EPP have been shared widely across year groups and pupil groups	4.1%	8.2%	87.8%
I personally have improved my teaching of STEM subject(s) due to the EPP	0.0%	20.0%	80.0%
I personally have improved my leadership of STEM subject(s) due to the EPP	0.0%	15.2%	84.8%
I would recommend the EPP to another group of schools	0.0%	6.1%	93.9%
The EPP has increased my interest and enthusiasm for teaching STEM subjects and/or staying in teaching	0.0%	18.2%	81.8%
The EPP has helped improve my career development	0.0%	18.8%	81.3%
PLANNING DESIGN AND MANAGEMENT			
The EPP supported the more general aims, ethos and objectives of our schools	0.0%	2.0%	98.0%
We have successfully achieved the aims and targets set out in the action plan	2.0%	14.3%	83.7%
The structure and support provided by STEM Learning (e.g. action planning, guidance, monitoring tools) has been beneficial	4.1%	26.5%	69.4%
The EPP award funding is/was sufficient to achieve our partnership aims	0.0%	12.2%	87.8%
The time I have personally spent on the planning and organisation required for my partnership has been beneficial to meet the partnership aims	0.0%	17.6%	82.4%
The monitoring and assessment requirements associated with the programme are/were supportive of achieving our partnership's aims	14.3%	16.3%	69.4%
DEVELOPMENT AND SUSTAINABILITY			
Our partnership is/will be sustainable at a similar or greater level of activity now/after the EPP funding has ended	8.2%	20.4%	71.4%
It has been easy to engage with external (non-school) partners	12.2%	28.6%	59.2%
Our partnership would not have been possible without the finance provided through the EPP	4.1%	8.2%	87.8%

Evaluation of the ENTHUSE Partnership programme (2014-17)

Case Study: Churchend Partnership

Background

The Churchend ENTHUSE Partnership is a partnership of 5 primary schools in Reading, Berkshire, led by Churchend Primary Academy, a teaching school. The ENTHUSE partnership was set up in September 2015 as part of the third cohort of ENTHUSE partnerships.

Prior to the ENTHUSE partnership, Churchend Academy was a finalist entry in the 2014-2015 Rolls-Royce Science Prize competition with its ECOMAD project and winner of the Eden Project award. Churchend school looked to build on this success and actively sought out partner schools to expand science projects and professional collaboration beyond

their school. Nearby schools, Park Lane Primary, Moorland Primary, English Martyrs Catholic Primary and St Michael's Primary joined with Churchend Academy to form the ENTHUSE partnership.

Context

The main focus of the partnership has been raising teaching standards.

At the programme outset, science attainment in the new partner schools was behind that of Maths and English. Also, there were large differences in skills and confidence in science: one school had two teachers with science degrees, elsewhere teachers had not studied science beyond GCSE.

The partnership leader and Churchend science co-ordinator at the outset of the project, Nik Allen, is a trained Physicist with a PhD in Particle Physics and 15 years industry experience in IT and Telecoms. Given this range of experience and expertise in STEM and teaching STEM subjects, existing links with STEM experts and Churchend's status as a teaching school, the partnership was in an ideal position to share expertise and develop teaching through collaboration and schools learning from one another.

The partnership set an ambitious CPD target of 75 hours per year which included a programme of training, knowledge sharing, shared resources, personalised lesson observations and mentoring. Building staff confidence, subject knowledge and addressing individual school needs were all targeted from the outset. There has also been a drive to improve teaching with an enquiry approach and extensive practical work. All of this aimed to raise children's attainment and aspirations, and engage them with practical science and real scientists.

"We will maintain and extend our links with science and industry (STEM) experts, and with local community projects to generate interest amongst pupils and help them understand and visualise what being a scientist means"



Churchend Academy were a finalist in the Rolls-Royce Science Prize 2015 with the ECOMAD project.

Partnership Action Plan

Impact on Pupils

The project has resulted in several benefits for pupils including improved engagement and motivation in science and increases in academic attainment, in particular for pupil premium pupils. After 10 months, 70% of children in the partnership agreed that they enjoyed science lessons, up 2% from the previous year. Data from the first 10 months of the EPP shows that attainment improved with the number of children meeting age related expectations or higher increasing from 46% to 51%. Success in lifting pupil attainment has been stronger in two of the five partnership schools as these had not engaged in school-wide science projects and practical enquiry- based learning before and therefore had most to gain. At two schools, the change was 34% to 80% and another was 47% to 67%. 82% of children made or exceeded expected progress in the first 10 months of the ENTHUSE partnership. Data were collected via Pupil assessment tools from STEM Learning, pupil perception surveys across the 5 schools and common summative assessments to assess the impact on pupil attainment.

“[We learnt about] the digestive system and saw acids like bile. We made our own system. We learnt that it takes a long time to digest. When we made our system, it actually looked real!” – Year 4 pupil

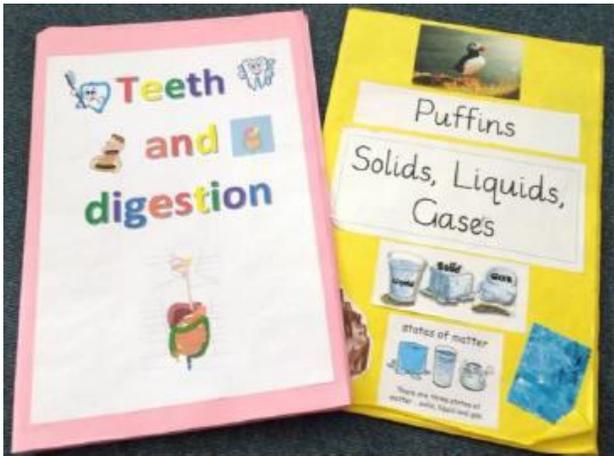
The ENTHUSE partnership has been successful in encouraging practical, child-led investigative science. Practical starter activities (see left) are being used to promote scientific discussion and investigation. Pupils in another school wore lab coats and goggles for science, asked ‘what if?’ questions and were given the opportunity to explore scientific equipment – all of which promoted rich discussion and use of scientific vocabulary and thinking.



Pupils mix oil and water and investigate which materials float above or below each layer in a practical lesson starter.



Pupils launched rockets during ‘Space Week’. There was also an exhibition where partnership schools met together to discuss what they had made/experimented with for Space Week. The children took it in turns to look around other exhibitions whilst others remained on their exhibition stall to teach pupils from the other schools about what they had learnt and made during their project.



Use of class project books helped allow a greater emphasis on practical science and investigation.

“We received training on using class books which generates a high level of discussion and draws out where the children want to take their learning.” – Science coordinator

Impact on Teachers

Teachers reported increased confidence to take a more practical approach to science and give the children ‘free reign’ to investigate and ask questions with well-designed practical resources. One particularly valuable activity supporting this and thereby having an impact on teaching was training in and sharing of practical lesson activities and lesson starters. Engaging activities inspire pupils and teachers and promote rich discussion and investigation.

Teachers in the Churchend partnership received training from the local Science Learning Partnership and other experts in teaching STEM subjects including from Oxford Brooks. The programme has both targeted and wider-reach impacts on teachers. Twilight training focussed on practical science and accurate assessment. At one point the project engaged 75 teachers and gave them first-hand experience of practical science and assessment strategies. Feedback from the twilight CPD indicates that teachers left ‘inspired’.



As a Teaching School and the leader of The Reading Teaching School Alliance, Churchend Academy has been able to spread professional learning widely, engaging with around 20 to 30 other schools.

Key Partnership Professional Development Activities:

- lesson observations across schools
- an in-house training programme from professional STEM trainers

- twilight CPD sessions
- sharing of resources, lesson starters and teaching activities.
- regular meetings and planning sessions
- a lecture programme from Oxford Brookes

“After the meetings and the training that we have had, there been a buzz, [teachers] want to go out and try their ideas, one of the lead teachers has been great at sharing lesson starters to engage the children at the beginning of the lesson, and that had a really big impact on the children” - Coordinator/teacher

Impact on Partnership Schools

Partnership reporting and the external evaluation agreed that the profile of science has been significantly improved across the partnership, with staff and pupils more enthusiastic about science. There has been a high level of commitment from all schools and regular meetings between the science coordinators.

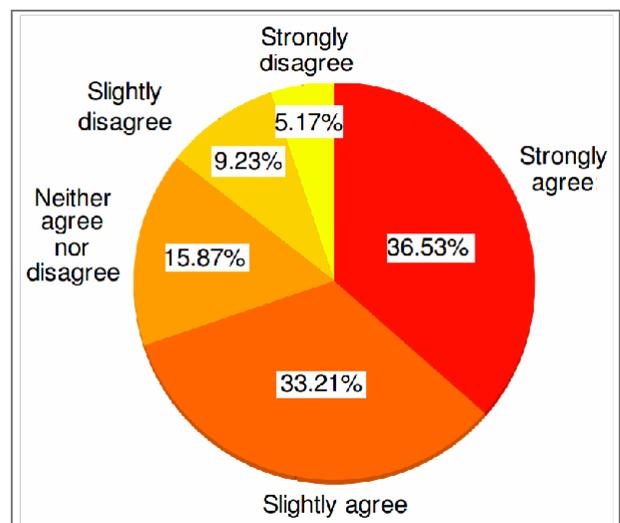
Commitment from school leaders has grown as the benefits of the partnership arose.

Schools have maintained and made a rich variety of links and engagement with STEM experts and organisations throughout the project. There have also been succession planning and handover activities, as new teachers take on coordinator roles and newly qualified teachers are involved in the professional learning.

“Over the year, we’ve working in Bracknell Forest Council, Reading University, Imperial College, Reduce Energy Ltd, Kew Gardens, a STEM ambassador and local conservation groups to expose children to the life of real scientists” - Partnership Qualitative Report

Key Successes

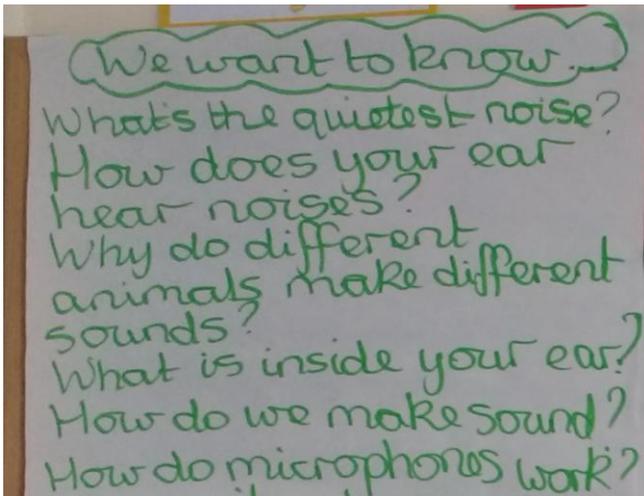
One key success of the partnership has been to increase children’s enthusiasm for (see right) and aspirations in STEM and help them understand the link between classroom activity and future careers. One initiative was to hold a ‘speed networking’ session with STEM Ambassadors from a range of STEM backgrounds including electronics, computing, chemical engineering, chemistry. Pupils spoke to each ambassador about the link between STEM subjects and their career. Ambassadors also spoke about their own school experiences in STEM subjects and school more generally to help the children see that they too can pursue STEM careers. This is one of many opportunities children have had to engage with ‘real’ scientists.



After 10 months, 70% of children in the partnership agreed that they enjoyed science lessons, up 2% from the previous year.

Ongoing and Future Plans and Aspirations

As the partnership develops, they aim to continue to move from prescriptive and pre-designed experiments to child-led practical enquiry, formalising the enquiry approaches and developing experience and expertise with the use of practical equipment and in supporting children's investigation and knowledge. Other areas for partnership development include building capacity and expertise in science assessment, especially to capture rich scientific investigation and making links across curriculum, building skills to support science in mathematics and literacy for example.



Children created their own questions to explore during their topic on sound (above). The whole class then investigated how sounds were made using musical instruments and other materials.

Evaluation of the ENTHUSE Partnership programme (2014-17)

Case Study: Mary Elton Group

Background

The Mary Elton partnership is a group of 6 primary schools based in North Somerset. The partnership is led by Mary Elton Primary School and is connected to the South West Science Learning Partnership.

The schools have a long history of collaboration in science and, from the outset, had considerable expertise in teaching STEM subjects to draw upon.

The school partnership became involved with the ENTHUSE project in September 2014 in the first cohort. They aimed to share the benefits of their STEM expertise more widely and run STEM projects and professional development on a larger scale and involving many more nearby schools and pupils.



Science week starts with a bang!

Each year, the Mary Elton partnership run a STEM project during Science Week. The scale and ambition of these has grown with the ENTHUSE Partnership Award.

In 2017, pupils arrived at school in the morning to find spacecraft debris covering the field and the area being guarded by police and the fire service. This led to the 2017 Stomp Rockets competition.

Annual STEM competitions:

- 2013 – Land Yachts
- 2014 – Catapults
- 2015 – Shelters
- 2016 – Wheelchairs
- 2017 – Stomp Rockets

Context

The partnership began having already created a range of business, university, scientific and industry links. These relationships had been nurtured over time and were actively pursued by staff. However, with little funding available, it was hard to run STEM projects on a larger scale, involving collaboration between children and staff from across the partnership and other nearby schools.

A key vehicle for such collaborative learning was an annual project and competition, which took place during Science Week. This project-based model for creating real, engaging and cross-curricular STEM learning had been developed prior to the ENTHUSE award. The partnership now aimed to develop it to drive collaboration, professional learning and pupil engagement and achievement in STEM subjects.

“We want to undertake future science challenges that involve stronger ties with industry... We will work with a science and engineering company and shadow them through the design, production and delivery phases, in a real life situation with the children involved at different steps.”

Partnership Action plan

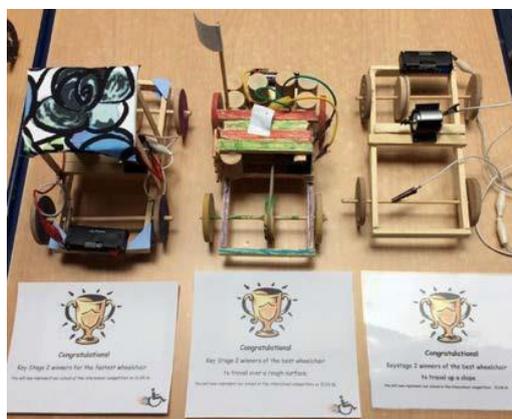
Impact on pupils

A key impact for the partnership was to improve engagement and attainment of girls in science. The partnership aimed to increase levels to 10% above LEA standards in 2 years. After the first year of the programme, there were 11.5% girls above national science achievement levels across the partnership, up from 8.8% prior to the programme. Increases in the numbers above (and decreases for pupils below) were observed for all pupils, with 26.5% above national expectations after one year on the programme, up from 17.7% prior to the start of the programme.

Pupils from across the partnership spoke with great enthusiasm and understanding about practical work such as dissecting plants and adding food colouring to their water, making and testing shelters, testing the strength of eggs, seeing how exercise changes their pulse and much more besides.

“We had to make rockets that would fly. We learnt about gravity... it was extremely fun!”

Year 6 Children



Annual projects and competitions across the partnership and many other nearby schools allows the children to grapple with real-life design problems. Supported by external STEM experts, their teachers and other pupils, the children can see the practical value and application of STEM subjects. Pupils use STEM ideas (such as aerodynamics and gravity for bottle rockets and friction, electricity and materials for wheelchairs) in a practical and exciting context. They meet and work with pupils from other schools and learn about the wider issues linked to each project. As part of the wheelchairs project in 2016, children worked with a grass-roots wheel chair manufacturer and a school in

Tanzania.

The children’s wheelchair designs were tested using criteria such as speed, performance on rough surfaces or on a slope.



This practical, fun and cross-curricular approach to science is part of the culture across the partnership, including in their everyday science lessons. During CUREE's visit, pupils were learning about plate tectonics using models with play dough earth layers and having earthquake alarm drills!

There are regular visits from STEM experts, clubs and trips aimed at inspiring the children and helping them see the applicability of science. Examples include a scientist from the local water works to talk about water pollution, the 'Fizz pop' science after school club, a hovercraft demonstration in assembly and involvement in the Hypatia project and a visit from a female medical student to engage girls in science.



Children from across the 6 partnership schools and 11 other nearby schools participated in the 2017 British Science Week stomp bottle competition.

Key Partnership Professional Development Activities:

- Network meetings
- Autonomously delivered peer- to-peer work between schools/colleges (quality assured)
- Face to Face CPD Courses
- Facilitated resource or CPD development
- Teaching and learning diagnostic services
- One-to-one tutoring sessions

To ensure the project stayed on track science Coordinators held meetings 3 times per year to discuss science and to monitor and plan progress against their aims.

Impact on teachers

Teachers report developing the confidence and the technical skills and vocabulary required to set practical science challenges related to robotics, electronics, synclastic and anticlastic modelling and frame building for powered models. The evaluation data from CPD activities (see left) have been resoundingly positive.

Drawing on both external and internal expertise has been integral to the success of the partnership. The partnership leader, Steve Thurgur, for example, taught other staff in the partnership about the use and teaching of electronics as part of the wheelchair challenge.

It has been possible to develop existing and new links with external STEM experts to support professional learning. One existing link was with the engineer, Benedict Whybrow, who was involved in the construction of the Wimbledon centre court retractable roof.

Previously Benedict supported in judging the annual competitions, the ENTHUSE funding supported him taking a wider role to demonstrate engineering techniques and concepts to both teachers and pupils as part of the annual competitions.

“The teachers were very scientifically minded... My particular situation was that it was a very specialist field and I had a lot of backup material I could bring to that, but once the teachers had done their little workshop with me they were away then, they had it”

Benedict Whybrow interview

Impact on partnership schools

Since beginning the ENTHUSE partnership schools have noted a higher profile for science in their schools. Teachers have seen this leading to increased enthusiasm and understanding amongst pupils.

Across the partnership there have been links and engagement with a wide variety of STEM experts. This includes STEM Learning's STEM ambassadors, the local Science Learning Partnership, visits from university students and 6th formers, from members of the local community, from business and industry and STEM experts.

One notable aspect of the partnership is its willingness and success in involving nearby schools outside of the partnership. A total of 17 schools were involved in a rockets project. This outward looking approach extends to holding INSET days and outreach CPD for many nearby schools.

“It has developed a shared understanding and enabled the children in school to see that what we do in the classroom impacts other children in other schools, has application in the real world and enables friendly competition and cooperation and therefore allows children to stretch their learning.”

Science leader and teacher

Key successes

Harnessing annual science competitions as a vehicle for pupil and professional learning

Mary Elton Partnership's approach exemplifies a model for engaging large numbers of pupils and staff in rich, immersive and cross-curricular learning. The partnership has a clear vision of real-life applicability and value of STEM subjects; how to combine science, design and technology and maths learning into projects which involve all year groups and partnerships; and how to draw on the skills of STEM experts such as engineers like Benedict Whybrow who have been a position to support both teachers and children's learning.

Common aspects to the annual projects include joint planning across the partnership; linking the project to Science week and other engaging activities; situating the project into a wider context; giving children space and support to design, make and test their projects; the utilisation of expertise and skills across the partnership and from external STEM experts; sponsorship by local business; planning for links with the curriculum; opportunities for pupil collaboration and sourcing of funding such as sponsorship from business and industry.

Ongoing and future plans and aspirations

The Mary Elton Partnership's STEM funding finished in June 2016. Through links that were maintained and sourced during the award period, the partnership has been able to sustain its activities and approach to science (see below for details of this year's annual science competition and its funding).

The partnership plans to fund ongoing continuing professional development and learning (CPDL) by inviting in non-partnership schools to attend the sessions that they run. This will share the benefits widely in a sustainable model of partnership and professional development. The school is developing a website hub to manage this and have plans to be a regional hub for school STEM collaboration and CPDL. Events such as their annual science conferences and summits, along with plans for national events, will all enable the partnership to keep its momentum and continue to share and develop expertise and enthusiasm in teaching and learning for STEM subjects in the longer term.



This year's STEM project as part of 2017 British Science Week has involved children designing pump rockets. These were tested against the criteria of distance and accuracy. The rocketeers then went to the South West finals held at Clevedon

School's sports hall. They competed against 17 schools and came back with a certificate for a winning design. The competition was judged by a long term supporting engineer - Benedict Whybrow. The project was organised through outreach work, via STEM (Science, Technology, Engineering, Maths) funding from industry. It enabled 4000 children to access this science project in the 17 schools for just £1000, or 25p per pupil.

Evaluation of the ENTHUSE Partnership programme (2014-17)

Case Study: Woodford Halse iMAT Partnership

Background

The Innovate Multi Academy Trust (iMAT) is a group of 4 village primary schools in the Northamptonshire countryside. For two years prior to joining the ENTHUSE programme the schools have collaborated to develop the teaching and learning of literacy and maths. The partnership wanted to boost attainment in science and raise its profile, making science 'part of the identity' of the schools. The Woodford Halse ENTHUSE Partnership began in September 2016 as part of the fifth ENTHUSE cohort.



The Woodford Halse ENTHUSE Partnership built on the pre-existing Innovate Multi Academy Trust (iMAT) partnership.

“Since the demise of Science SATS at Key Stage Two, the priority for science has been lower in comparison with the other two core subjects. Using this project, we are keen to redress the balance...”

Partnership Action Plan

Context

A key aim for the partnership is to improve the levels of attainment and progress of all year 5 and 6 pupils in science. At the outset of the project, however, there were no year 5 or 6 teachers with science qualifications beyond GCSE and limited experience of working with a focus on scientific enquiry. While the iMAT had a collaborative relationship based around other subjects, the profile of science was low and there was little science collaboration either within the iMAT or with external organisations or individuals.

The schools did a staff skills audit at the outset which identified that teachers needed more input for ideas and activities, as well as the skills and confidence to adopt a more practical, enquiry-based approach to science learning. Pupils' attainment in the targeted year 5 and 6 groups was around the national average. Yet, when the schools conducted a baseline pupil voice survey, they found that many pupils were unsure of what science actually was and had a limited understanding of its real-world value and applications. The schools planned to develop the skills of their teachers through continuing professional development and learning (CPDL) and through establishing new links to local STEM business, industry and other organisations. They also decided that each of the 4 schools would apply for the Primary Science Quality Mark (PSQM) bronze science award to provide additional impetus and profile for science.



Impact on pupils

Although yet to complete the first year of the partnership, early indicators suggest some significant progress in science attainment, especially for pupils with below average attainment. Outcomes for years 5 and 6 (age 9-11) are a focus for ongoing evaluation of the impact of the partnership. Baseline activities also identified boys attracting pupil premium funding as a group for particular attention and monitoring.

Parents are reporting that their children are excited by science and come home talking about what they have learnt. This is an early indication of impact against a key partnership aim to make science 'come alive' and make it more practical and engaging. Teachers and science co-ordinators across the partnership schools visited also commented that pupils are more aware of the value of science and expect this to be reflected in future pupil voice surveys.

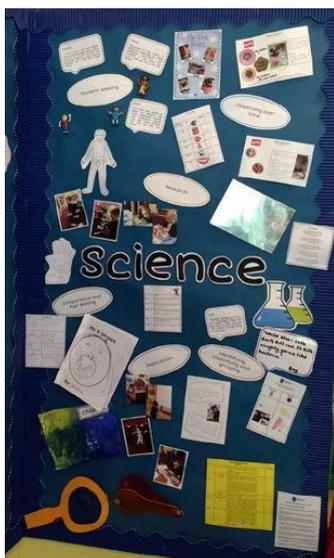
"Children have responded very well to the enquiry approach and are making faster progress because of higher motivation... There is a strong buzz about Science as a result."

Partnership Qualitative Evaluation



A rich, enquiry-based approach to science was evident across the partnership schools. During CUREE's visit, Year 6 children across the schools were testing solar-powered buggies which they had made and investigating their own questions such as whether the intensity of the light or terrain matters. One class were trying to find out whether covering the solar cell with cellophane made a difference and whether there were differences by the colour and opacity of the cellophane. This investigative approach extended right down to the youngest children. Reception children described their investigation into helping the gingerbread man cross a river using bridges they designed and made.

Whole-school science assemblies and demonstrations from Atomic Tom and Cosmic Chris were so successfully that take up of after-school science clubs jumped to over 50 children.



The partnership has also worked hard to help pupils understand the value and applicability of science. Many trips and visits have taken place or are planned including a trip for children attracting the pupil premium to visit a local university, where they extracted DNA from a strawberry; visits from local businesses such as an electrician and a visit from a family support worker who helped pupils investigate the sugar content of fizzy drinks. Pupils have also learnt about parents who are scientists and the applicability of science to many jobs.

Across the partnership, displays were filled with children's enquiry questions, scientific explanations, examples of their work, photos of practical science investigations and scientific vocabulary.

Impact on Teachers

Teachers have developed skills, ideas and confidence to allow children to take a more practical approach and to investigate their own scientific questions. Prior to the partnership science teaching often heavily relied on presentations, videos and prescribed experiments.

Teachers are also making more extensive and targeted use and application of mathematics in science, another area of focus. The effective use of mathematics to measure, record and present data was evident in pupils' work and the lessons observed during the evaluation visit.

Representatives from each school attended CPD from their local Science Learning Partnership in Northampton. External CPD has also been coupled with in-house training from the partnership leader, and embedded throughout the schools through approaches like lesson study and in collaborative planning.

Partnership Professional Development Activities:

- joint planning
- network meetings
- external CPD sessions
- assessment moderation
- lesson study
- coaching and mentoring
- attending an Association for Science Education (ASE) Conference.

There have also been opportunities to develop leadership in STEM subjects. To have maximum impact, external CPD was then cascaded to all staff by the science co-ordinators. Opportunities to work collaboratively across schools and key stages, handover of responsibilities (such as running science clubs or science co-ordination) and working with Newly Qualified Teachers during the first year of the partnership have built capacity and developed leadership. Staff have also benefitted from joint planning of science into thematic curricula and from sessions designed to identify links between STEM subjects and other curriculum areas, numeracy and literacy in particular. Professional development has also extended to support staff who – as well as teachers - have been using 'ReachOut CPD' online courses to refresh subject knowledge on current topics.

“Teachers blog about their classes' science activities and use the iMAT Google site to share ideas and resources. It has also been possible for pupils to share the results of their scientific investigation with other pupils across the ENTHUSE partnership.”

Impact on Partnership Schools

The profile of science has been raised across of the partnership schools. This is supported by the commitment from all schools to achieve a Primary Science Quality Mark (PSQM) bronze science award. Schools have all agreed to contribute £3000 over year 1 and 2 to the partnership as well as paying for the PSQM. Funding has also been raised from parents for optional after-school science and funding has been sourced from businesses for science resources. Activities, funding and buy-in from all stakeholders are seen as complementary, providing impetus for improving science teaching and learning and creating sustainable collaboration.

“There is much more collaboration [within the iMAT] now. Real collaboration right on through with shared aims and objectives ... It's quite exciting”

Science co-ordinator

Key Successes

Opportunities for Sharing and Collaborating for Children and Adults

The ENTHUSE partnership greatly improved the collaboration previously established through the iMAT by enabling the schools to plan joint science events and lessons, including children sharing results with others across the partnership. Joint working enhanced the value of existing activities such as moderation as it was possible to see the results of the same activity across the partnership and for teachers to learn from each other's experiences. There has also been chance for lesson observations across schools, team teaching and joint planning. One collaborative activity from near the outset of the ENTHUSE partnership was to develop a list of common principles for science linked to the PSQM. These joint principles were then displayed in all classrooms and the principles were clearly evident during the CUREE evaluation visit. Building on existing collaborative structures in the iMAT and sharing ideas and working collaboratively online allowed cost-effective and sustainable approaches to collaboration to develop.

As well as the partnership leader and science co-ordinators, a key supporter of the partnership has been the Woodforde Halse school governor who has a background in science and a director with Association for Science Education (ASE). She played a key role in writing the partnership action plan, attends staff meetings and sources funding and opportunities to support teaching and learning across the partnership.

Ongoing and Future Plans and Aspirations

Now nearing the end of their first year the partnership is looking for further sources of funding, looking to establish further links with the community and local businesses. They are also looking to establish links with a secondary school and are considering a transition project to support pupils moving from primary to secondary. Initial plans in this area were frustrated by the closure of the local University Technical College.

The partnership arranged a 'Colour Chaos' science week where each class took part in the same investigation and shared the results on the iMAT website. Activities across different year groups included using sorting diagrams and keys to classify Liquorice Allsorts by their colours and properties; an experiment into the water solubility of skittles and how factors such as water temperature or acidity affected this (left); an experiment in which ice cubes were left to melt on different coloured pieces of paper; and using colour spinners, blacked out room and prisms to investigate light and colour. Pupils spoke to the CUREE researcher with great enthusiasm and understanding about what they had learnt.



“The skittles experiment was very fun and we had a great time doing it. One day can we do it again?”

Year 4 Pupil