Helping you to improve social outcomes

Triple Science Support Programme

Final evaluation report

27 April 2016

Client	STEM Learning Ltd
Company	OPM
Title	Triple Science Support Programme
Subtitle	Final evaluation report
Dates	last published 27/04/2016 last revised 27/04/2016
Status	Final
Classification	Restricted External
Project Code	9946
Author(s)	Max Kowalewski and Myles Wilson
Quality Assurance by	Dr Chih Hoong Sin
Main point of contact	Max Kowalewski
Telephone	0207 239 7833
Email	mkowalewski@opm.co.uk

If you would like a large text version of this document, please contact us.

OPM

252B Gray's Inn Road
London
WC1X 8XG

0845 055 3900
www.opm.co.uk
info@opm.co.uk

Contents

1. Executive summary

OPM conducted an evaluation of the Triple Science Support Programme (TSSP) across the years 2014-2016 of the programme, to evidence the extent of impacts of the programme on three key groups: teachers; students; and science departments, senior leaders, and whole schools.

The evaluation finds that:

1. **The TSSP has helped schools make considerable improvements in their triple science provision, supporting the development of individual teachers' knowledge and skills as well as increasing the capacity and capability of science departments to teach triple science.**
2. **These improvements have led to positive impact on students, who currently study triple science, who consider taking triple science, students studying other sciences, and the uptake post-16. The evaluation collected evidence showing:**
    - **significant gains in motivation and engagement of students in triple science;**
    - **impacts on teaching and student outcomes for students in other science classes, including those learning science at KS3 and KS5;**
    - **increase in progress and attainment in triple science;**
    - **higher numbers of students wishing to study triple science, and science at post-16 level.**
3. **These positive changes are likely to be sustained, and further impact for schools is expected in the longer term. However, this is conditional on schools being able to cope with additional external and internal pressures (e.g. the introduction of new educational measures and policies or issues around staffing); and on the availability of senior leadership support for further development of the triple science provision.**
4. **The TSSP delivery model, which offered schools bespoke advice and a range of CPD options and resources, proved very effective in supporting schools to develop their triple science provision. Each school having educational experts[1] to guide and support them through the development process of needs analysis, action planning, and evaluation; and the bespoke in-school CPD, was a particular strength of the programme.**

[1] I.e. the TSSP advisors, and regional leads, supporting schools through the TSSP process, enabling their development of triple science provision with CPD, as outlined further on in figure 1. Throughout this report they will be referred to simply as 'advisors' unless otherwise stated.

2. Main findings

1. We found **good evidence that TSSP aims and goals have been achieved** and that **TSSP has helped schools improve their triple science provision.** A majority of schools (90%) indicated that the programme helped them improve their triple science provision; and that they achieved all or most of their own intended outcomes from the support provided.
2. **We found impacts across all levels** – for teachers, whole departments, at the whole school level, and on students themselves.
3. **The TSSP achieved the greatest immediate impacts on teachers**, particularly for NQTs, new department heads, and those teaching triple science subjects outside their specialism. Across all evaluation data sources, evidence shows that the support of the TSSP increased teachers' enthusiasm and confidence (90% of schools noted high or medium impacts in the endline survey), subject knowledge (79%), teaching and pedagogy (88%). This, together with support at the whole department level, was consistently found to have led to an improvement in the overall quality of teaching of science (78%), and in departments' capacity to teach triple science (72%).
4. **The above improvements have led to positive outcomes for students.** Most immediately, student confidence and engagement in triple science increased (74%). We have also found improvements in student progress and attainment (66% and 62% correspondingly) due to the improvements in the quality of teaching. There was also improved student behaviour and safe working (56%); increased student interest in taking triple science (51%) and higher motivation to take, and/or uptake of science subjects post-16 (46%).
5. Better provision of triple science coupled with noticeable increases in student interest in triple science options and student overall attainment in science, made schools more confident about the future take-up of triple science.
6. Only a few schools directly targeted vulnerable groups[2], but those that did found the TSSP to be effective in improving triple science outcomes for these.
7. We found good levels of impact on **colleagues in and across the department and school** with the strongest impact on the overall quality of teaching (78%), including sharing of practice and resources (77%) with increases in collaboration with colleagues in departments (77%), and an increased capacity within departments to teach triple science (72% of schools).
8. There was evidence for **improved leadership** of the triple science curriculum (67%), as well as for science teaching and departments in general. The support from advisors

[2] Which vulnerable groups were targeted varied by school, and so this can include girls, students receiving pupil premium/free school meals, those with English as an additional language, and others.

helped heads of department successfully navigate changes in the educational policy context; and on the needs analysis and action planning process, often involving senior leadership, also helped improve the strategic planning and management of CPD, particularly for triple science.

9. We found good evidence of the programme having a positive impact on the **whole science curriculum provision** and delivery as the TSSP support also helped schools improve their curriculum planning, teaching approaches including for practical learning, and the use of resources across other science classes, in the whole 11-19 age range.

10. **The TSSP model is successful overall.** Given the range of starting points and challenges of schools in the programme, providing them with tailored support that addressed their specific needs around developing triple science provision has been crucial in securing outcomes for schools. The support was found to be of high quality overall. Schools particularly benefited from bespoke in-school support delivered by advisors. While other elements of support – scheduled external courses, online resources, and networking – were also beneficial, these required more time and effort to establish, and had lower levels of uptake, and hence led to more mixed reports of their effectiveness, compared to the bespoke elements.

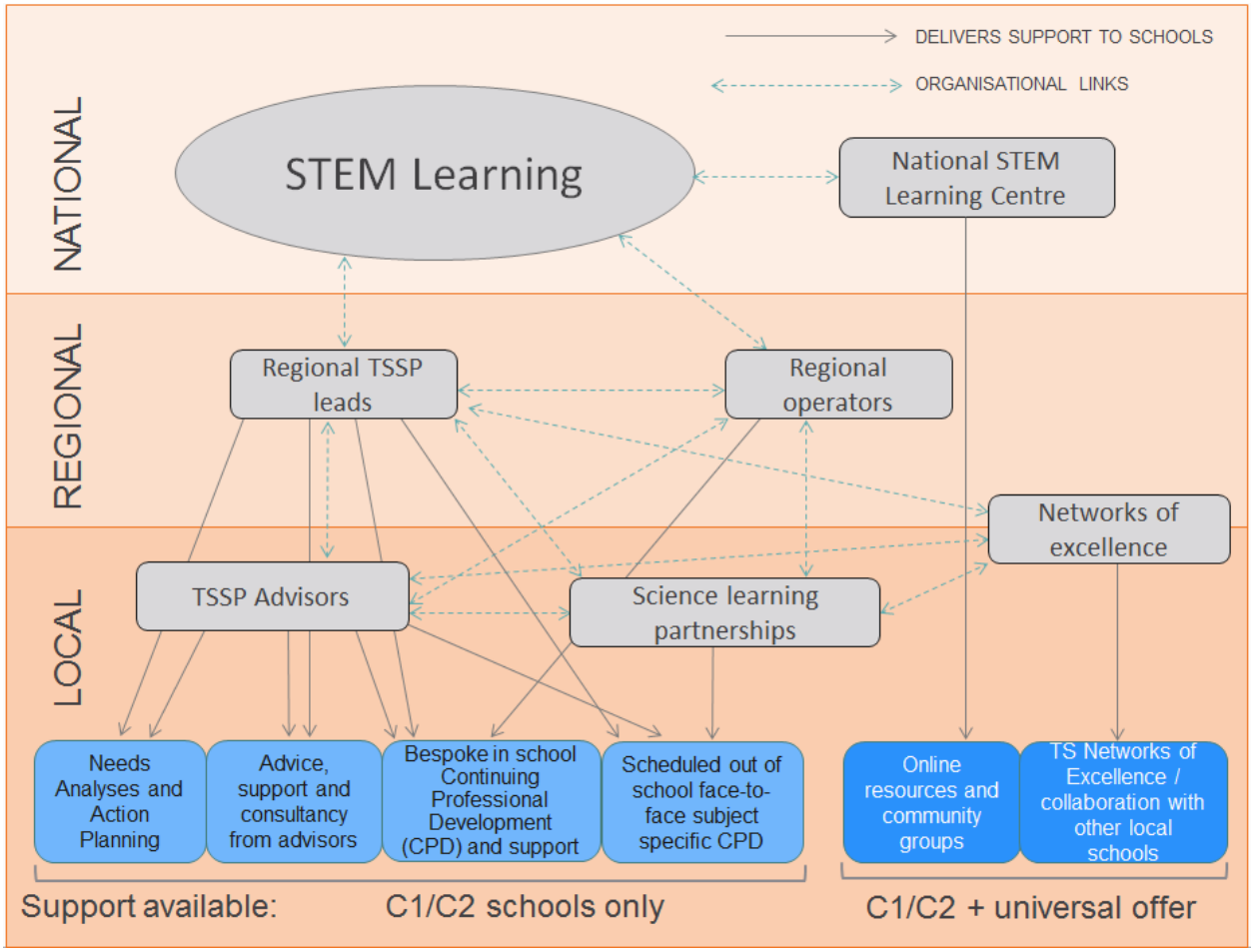
11. **Schools face ongoing barriers, which limit the sustainability of these impacts.** The changing educational policy landscape was a limiting factor in schools' triple science provision and affected their ability to engage with the programme. The TSSP was partially able to address these factors, in supporting schools to adapt to these changes. The impact of the programme was also limited by several internal challenges for schools, including staff turnover, resourcing, and support of the school leadership. The achievements of the TSSP have been in spite of these considerable challenges.

3. Introduction and context

The Triple Science Support Programme (TSSP) is a two year programme of professional development support funded by the Department for Education and delivered by STEM Learning Ltd (formerly Myscience.co Ltd). The aim of the programme is to support schools to improve the provision of triple science, so as to increase the number of students in England studying GCSE triple science, including those eligible for funding from pupil premium (formerly free school meals); and build capacity in the teaching profession to lead on their own development in the future.

The programme targets support for schools with no, or very low, triple science provision (category 1 – C1, with identified capacity to offer triple science); and those with less than the national average number of students taking triple science or where attainment and progress of students taking triple science was below national average (category 2 – C2); as well as a universal offer to all other schools. Schools received support during either the academic years 2014-15 (year 1) or 2015-16 (year 2); a small number were supported in both years. The types of support on offer through the programme, and its structure, are shown below; the theory of change model can be found in Appendix 1.

Figure 1 TSSP delivery model and support available



Programme evaluation

OPM were commissioned by STEM Learning to evaluate the TSSP, beginning in September 2014. The focus of our evaluation is on the targeted schools (C1 and C2), over both years of the programme. The aim of the evaluation is to evidence the extent of impacts of the programme on key groups: teachers; students; science departments, senior leaders, and whole schools. Evaluation activities are listed below (a full overview of the methodology is given in Appendix 2, and detailed data from these is found in subsequent appendices).

- Online surveys with schools, (endline survey n=139); TSSP advisors and regional leads (endline survey n=38)
- Telephone interviews with schools (n=20), TSSP advisors and regional leads (n=12)
- Visits to schools (n=6)
- Analysis of programme documents: needs analysis and action plans (n=96 schools of which 46 Y2)

Context and barriers

In line with realistic evaluation principles[3], we evaluated the impact of the TSSP in the context of very significant changes in national education policy and the science curriculum. We found two key factors influenced the delivery and impact of the programme, namely changes to the government educational policies and challenges within schools. In relation to national policies:

- **Preparing for the new science GCSE specifications and other curriculum changes** are the key focus of development for science department leadership, which reduced their capacity to develop triple science provision and engage with the programme. This was particularly a factor for schools in year 2 of the programme. The increased numeracy and literacy requirements in the new GCSE have affected the numbers of students entered to take triple science (50% of advisors confirmed this as a very significant, or important, barrier).
- Due to the new government accountability **measures of Attainment/ Progress 8/EBacc,** schools are steering students away from triple science (52% of advisors confirmed this as a barrier). However, qualitatively we also found how a small number of schools are now opening up triple science to more students, rather than just those in the top ability bracket.
- Schools are challenged by the move to **linear assessment** (63% of advisors identified this as a challenge), as many teachers are not yet trained to teach approaches to linear assessment and students are concerned about nine hours of examination at the end of the course. In addition, the discontinuation of national attainment levels for assessment in Key

[3] R. Pawson and N. Tilley (1997) *Realistic Evaluation*, London: Sage.

Stage 1-3 was compounding this challenge, as schools are unsure how to select students for triple science.

Schools that actively anticipate and manage the transition and changes are better able to deliver triple science in this shifting context. Advisors often provided an extra benefit to schools in this process, giving them information and support to prepare for and confidently manage these changes.

In addition to the shifts in national education policy and the science curriculum, schools were also grappling with a number of internal challenges:

- **Staff shortages and turnover** are a common challenge across all schools. In addition, a lack of specialist teachers for individual science subjects (reported as a challenge by 52% of advisors) and general shortcomings in staff experience and confidence in triple science (identified as a barrier by 34% of schools themselves in Y2 action plans). This affects their ability to deliver triple science, and maintain continuity to sustainably develop their provision. The TSSP was able to mitigate this by increasing staff subject specialist knowledge and skills, thereby resulting in more staff being able to teach triple science classes.
- **Inadequate resourcing for triple science** was another common barrier; for instance, 28% of schools in Y2 action plans, and 65% of advisors reported inadequate allocation of curriculum time as a challenge. This limits schools' capacity to offer triple science to higher numbers of students.
- **The ability/willingness of senior leaders to prioritise triple science provision, and the necessary levels of CPD** to implement triple science, was a significant barrier, often found to underpin the above two. This was manifested in the lack of releasing staff for internal and external CPD (noted by 67% of advisors); partly due to funding pressures on schools, as well as management decisions on the importance and accessing of CPD. TSSP advisors were not always able to shift senior leadership team (SLT) attitudes through the programme.

Appreciating the challenging context within which TSSP has been delivered is important to help understand the impacts that the programme has been able to achieve. Despite significant challenges, we have found evidence of a range of impacts generated by the TSSP. These are set out in the following section.

4. Impact achieved by the TSSP

Overall impact

The TSSP has a positive impact on a wide range of outcomes. Schools commonly indicated that they achieved all or most of their own intended outcomes from the support, and we found good evidence that the programme's own aims and goals have been achieved. A majority of schools (90%) indicated that the programme helped them improve their triple science provision, as illustrated in figure 2. We found positive impact on student attainment, progress and take up of triple science.

We found impacts across all levels – for teachers, whole departments, at the whole school level, and on students themselves (see figure 3). Immediate impacts were highest on individual teachers. In our evaluation, we established that impact at teacher and department level is most immediately evidenced, whereas impacts on student uptake, progress and attainment take longer to evidence, although many schools that did not already see such impacts expected them to unfold in the longer term.

Figure 2 How successful was the TSSP in helping to improve triple science provision in your school? (Schools endline survey, n=137)

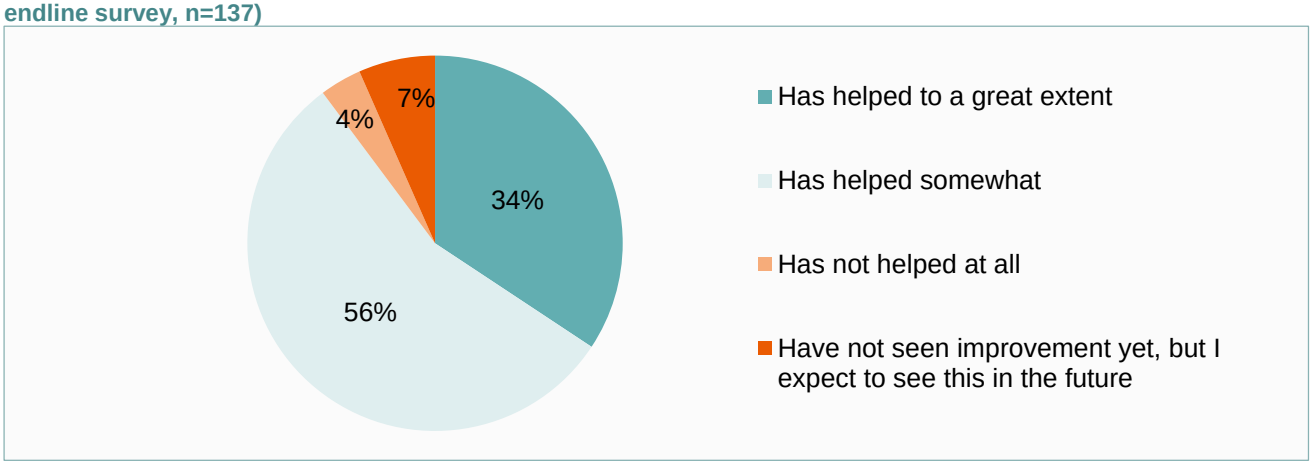
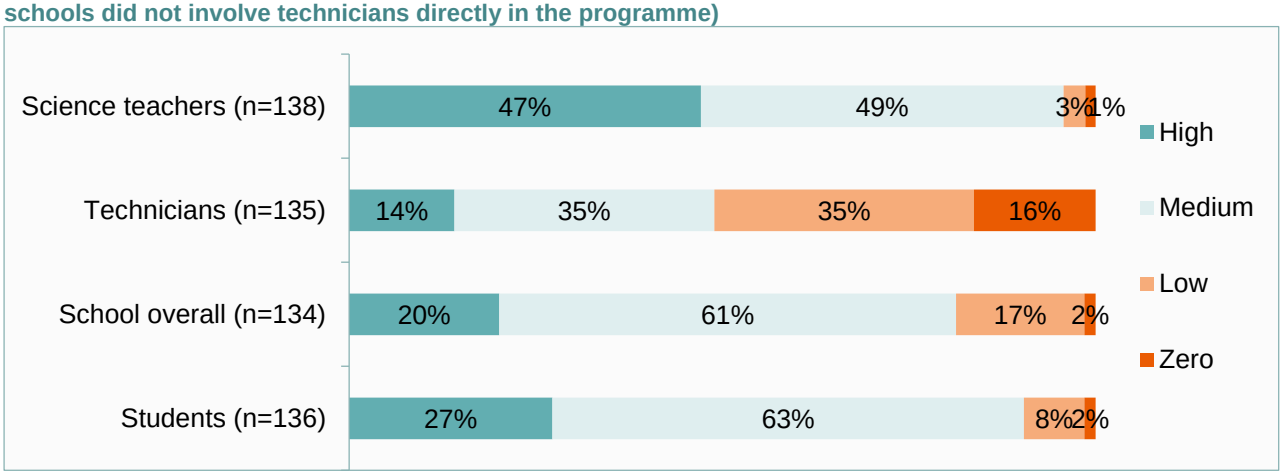


Figure 3 How would you rate the impact of the TSSP to date on: (Schools endline survey. Note that many schools did not involve technicians directly in the programme)



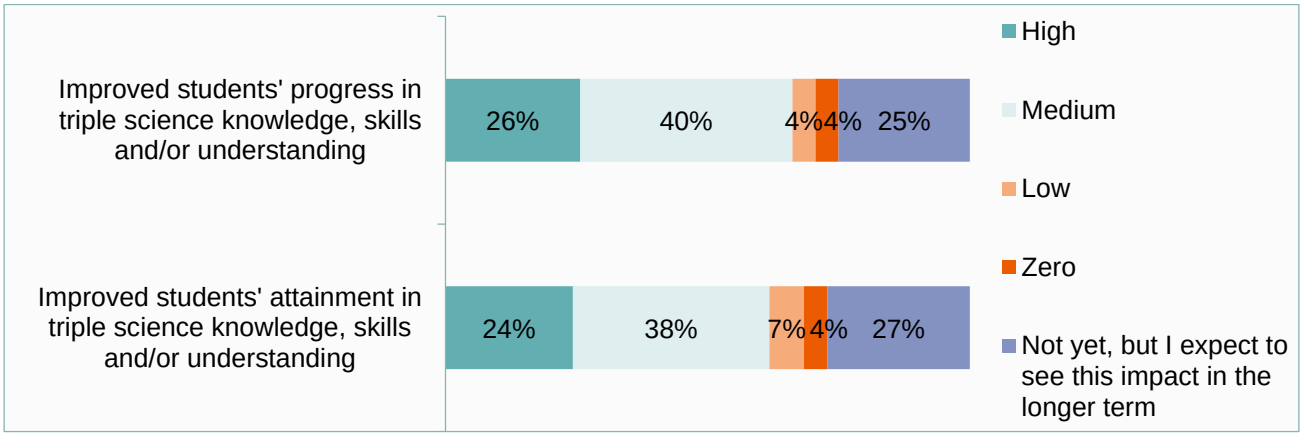
Impact on key outcomes – provision of triple science

Overall we found evidence of impact of the TSSP on the number of students wishing to take triple science and student attainment and progress in the targeted category 1 and 2 schools. These impacts were key outcomes for the programme and are detailed below; further impacts on students are reported later on in this chapter.

Student progress and attainment

We found that **the TSSP has been instrumental in bringing about positive changes in student progress and attainment in triple science**. Around two thirds of the surveyed schools rated the current impact in these areas as high or medium in schools (68% of Y1 schools and 58% of Y2 schools indicated increases in student progress; 66% of Y1 schools and 54% of Y2 schools reported increases in student attainment). Almost all other schools who had not yet seen changes in progress or attainment anticipated impacts in these areas in the longer term (25% of all schools expected improved progress, 27% improved attainment). The survey finding was corroborated by analysis of Y2 schools' action plan reviews (48% seeing impacts on progress, and 37% on attainment) as well as by advisors, almost all of whom reported the achievement or likelihood of achievement of such outcomes.

Figure 4 What impact, if any, would you say the TSSP support your school has accessed had on each of the following areas? (Endline survey, n=136)



> ***"Class data before and after the CPD support for triple classes shows that as teaching improves and engagement in science increases, attainment is slowly improving."*** *(DYHNE, C2, Y2)*

> ***"The training had a clear impact - a grade and a half increase in that teacher's class."*** *(NW, C1, Y1).*

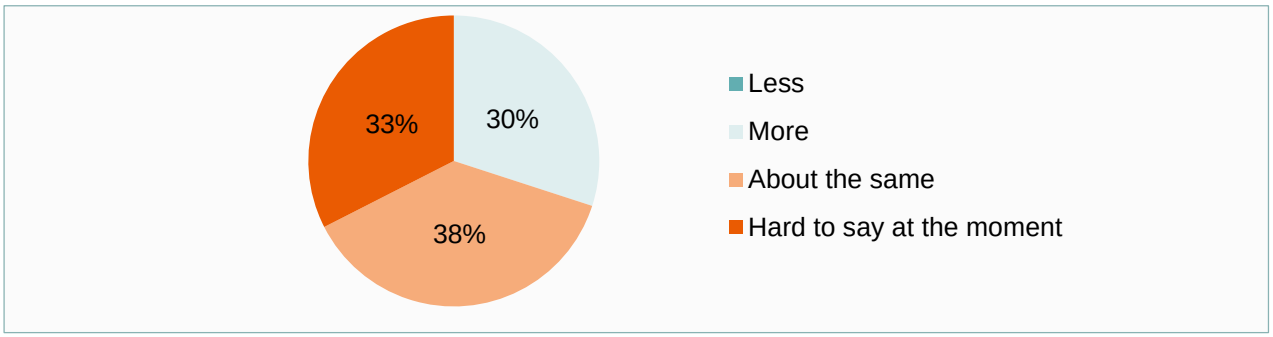
The programme helped increase student attainment and progress through improvements in the quality of teaching, of individual teachers and departments, which quickly benefited existing triple science cohorts. Particularly beneficial was improved planning and teaching of examination skills, pedagogy including practical learning, and subject knowledge.

Student uptake of triple science

Around a third of schools (30%) expected triple science numbers to increase as a result of the programme. None of the schools participating in the TSSP that we heard from expected their triple science numbers to fall, and only very few advisors anecdotally noted reduced triple science intakes in some of the schools they supported. These findings look particularly positive when compared to the nationwide picture showing an overall fall in triple size numbers.[4] The programme achieved this through a series of changes: it boosted teachers' confidence and enthusiasm for the subjects, which in turn motivated more students and helped improve their academic performance. Schools were also supported in their decisions to start offering science (for C1 schools); or, for C2 schools, enabling more students, not just the higher ability students, to access triple science, which also led to higher take up of triple science.

> ***"The support that we were given to develop KS3 schemes of work are now enthusing our kids, kids are feeling more confident with the science, so more are choosing triple."*** (Central, C1, Y1)

Figure 5 Will more or less students in your school study triple science after the support of the programme? (Schools endline survey, n=80)



Category 1 schools which previously did not provide triple science were more likely than category 2 schools to state that more students will take triple science as a result of the programme (39% compared to 29%).

At the same time, the evaluation established that the reported impact of the programme on students' enthusiasm for studying triple science was much more widespread than an expectation of seeing an actual increase in triple size numbers. While only 30% of participants were confident that the actual number of triple science students would rise, twice as many (68% of schools and 52% of advisors) reported at least some positive impact on **students' motivation to take triple science,** with further 23% of schools and 44% of advisors expecting to evidence this impact in the future. This means that while more students are considering studying triple science, not all of them, at least in the short term, will be able to pursue this option.

[4] Based on STEM Learning's analysis of the Joint Curriculum Qualification Summary, indicating large reductions in triple science numbers from 2013 to 2015.

Interviews with school subject leaders and advisors testify to the persistence of **school structural and organisational barriers to triple science** such as limits to maximum cohort sizes, selection/ability, timetabling, or other in-school factors, which impede the actual uptake of triple science. These barriers, together with the impact of the changes in national policy outlined above, explain why other schools were more cautious about expecting positive changes in triple science uptake; a message echoed by advisors, small numbers of whom anecdotally observed reductions in the triple science cohorts of some of their year 1 schools. One advisor noted that: ***"some schools have seen an increase whilst others have reduced their TS offer – [due to] EBacc and Progress 8".***

Structural and organisational changes require more time, effort and expertise and, quite predictably, we observed that schools, which joined the programme in year 1, were more likely to expect an increase in triple science uptake (48%) than schools which joined it in the second year and were often still receiving CPD support during the evaluation (21%). This indicates that increases to uptake, and other positive student outcomes, are likely to develop further in other schools in the programme in the longer term.

Interestingly, 67% of those schools that received a 'double dose' of support (firstly as C1 schools to introduce triple science and then as C2 schools to improve the provision, n=12) were confident that triple science numbers would rise, and these schools generally rated the TSSP support as more impactful. **This is a strong indication that the increase in the duration of CPD support offered to schools is most likely to result in growing numbers of students taking triple science**.

Impacts on vulnerable students

We found that most schools had not specifically targeted vulnerable groups, which reflects in the different starting points and priorities of these schools in the programme. Nonetheless, 49% of schools acknowledged that the engagement in triple science of students on free school meals (FSM), girls, or other vulnerable groups had been supported by the TSSP. We also know from analysis of Y1 action plans that raising attainment, stretch and challenge were a popular area for in-school CPD (chosen by 28% of schools), which often included strategies for lower performing groups.

Those most commonly targeted for direct support were girls, those on pupil premium, followed by those on FSM, and the TSSP was found to be an effective support in these targeted cases. Schools noted as a result triple science was ***"more representative of students from the cohort"*** (LSE C2, Y1).

Further impacts on students

As indicated earlier in the report, we found good evidence of impact on students in a large number of schools, particularly on students' confidence, motivation, and engagement in science lessons (74% in the survey reported high or medium impact); and improved progress (66%) and attainment (62%) in the knowledge, skills and understanding of triple science. These impacts were not confined just to the triple science groups, but were also reported by schools in other year groups and stages of the science curriculum. Other reported impacts were improved student behaviour and safe working (56%) and higher motivation to take, and/or uptake of science subjects post-16 (46%).

In comparison to teacher outcomes (see further in the report) , which were overwhelmingly reported as achieved, impacts for students were more often expected in the longer term, by both schools and their advisors. Unsurprisingly, schools in year 1 reported higher levels of impact on students, whereas year 2 schools, many of which were still receiving CPD and support through the programme, were more likely to state that student outcomes will increase over time. In both years, schools that had not already seen impacts on students expressed confidence that they will see increased outcomes for these over time.

Figure 6 Overview of top TSSP impacts on students

Confidence, motivation and engagement	• The most common impact was in confidence, motivation and engagement in students. It was reported by 74% of schools in the survey, 46% in the Y2 action plan analysis, and almost all advisors (85%). • This is a result of teachers' increased confidence from the TSSP support for improvements in lesson planning, teaching methods, resources, new practical learning, exam strategies; and direct TSSP work with students. ***"We organised for the students to do a forensic experience day which the kids really enjoyed and I felt like they got a lot out of that."*** (DYHNE, C2, Y2). ***"If the teachers are engaged, confident and enthusiastic then it does make it more enthusiastic for students"*** (SW, C1, Y1).
Progress and attainment	• This is another common area of high impact on students, for around two thirds of schools in the survey, and also high in Y2 action plans (48% for progress, and 37% for attainment) • As described above, as improvements in the quality of teaching quickly benefited existing triple science cohorts. ***"We've held lessons trying to help pupils to access long-answer questions and this is something we've implemented because of TSSP. As a consequence kids have been performing better on end of topic tests"*** (Central, C2, Y2). ***"The different practical activities introduced through the CPD are also embedded in the SOW and seen in lessons increasing progress and enthusiasm."*** (NW, C2, Y2)
Interest in and uptake of triple science	• Many schools have already seen impacts in this area; schools in the survey reported increased interest in taking triple science (51%) and uptake of triple science (30%). Increase in interest was lower in the Y2 action plan analysis, but we know that Y2 schools tended to expect student outcomes in general to be expected more in the future, and across the board, more schools expected this outcome in the longer term. ***"Due to the excellent sessions provided by [the schools' advisor], we have just had our options evening and many students have chosen triple science as an option"*** (LSE, C2, Y2).
Impacts on vulnerable groups	As outlined above, few schools targeted these explicitly, but where they did the support was effective. More schools reported indirect effects on the engagement of these groups as a result of the support in general (49% in the survey, 15% in the Y2 action plans) ***"Some of the "vulnerable group" students seemed to be more engaged in class where the ideas had been put into practice. Staff realised that these students can be engaged if the lesson is targeted to do this."*** (LSE, C2, Y2)

Other impacts	• Schools also often saw improvements to **student behaviour and safe working** (56% in the survey), explaining how better student engagement and more varied activities supported this. • Increased **motivation to take, and/or uptake of science subjects post 16** was reported by almost half of schools (46% in the survey). ***"We have had a huge increase in pupils taking post 16 sciences"*** (NW, C2, Y1)

Vignette A: School 1 (Y1, C2) has recently been through a lot of instability in its leadership and facilities, with triple science provision affected by a lack of physics specialists and disengaged students. The TSSP provided physics demonstrations in classrooms for KS3 and KS4, as well as offering staff new ideas for practical learning and assessment. This helped inspire and re-engage students in science, and one of the sessions particularly targeted vulnerable students. Discussions with the advisor on how to make triple science more accessible, and timetabled appropriately, helped the head of science in his discussions with the SLT; with all this in the longer term expected to support growing triple science cohorts. The support has already helped raise the profile of science generally within the school. The head of science noted that *"the kids were inspired, given a fresh outlook…that filters up through the years; a few are now opting for triple science."*

(More detail on School 1 is in Appendix 3).

Impact on individual teachers and technicians

In accordance with the programme theory of change (see Appendix 1), the majority of CPD support was focused on individual teachers, who also reported the greatest immediate impact on their confidence, knowledge, skills and practice. Qualitatively, we found that impact was greatest for NQTs, new department heads, and those teaching triple science subjects outside their specialism. The greatest change was seen on teachers' enthusiasm and confidence: 90% of teachers improved their confidence in delivering triple science in an engaging manner. Similarly strong impacts were on their subject specific pedagogy (88%) and subject knowledge and understanding of the triple science curriculum (79%). Around half of schools reported improvements in individual teachers' leadership and management.

Figure 7 Overview of top TSSP impacts on teachers

Increased enthusiasm and confidence	• We found this to be the greatest teacher-level impact, evidenced across the quantitative and qualitative data. 90% of schools from the survey stated high or medium impact as a result of the TSSP, and this is corroborated in the analysis of Y2 action plans where it is the second highest teacher impact (46%[5]). • Increased enthusiasm and confidence resulted from being given specialised support, new ideas and tools for teaching, tips for practical learning, and understanding of the curriculum. • Confidence grew in teaching out of specialism, especially physics. This is a particularly important outcome given the context of staffing shortages, especially for specialists. ***"[the support] brought a load of resources, ideas, to demonstrate physics concepts. Staff got a real buzz out of it, they really enjoyed it, it definitely increased their enthusiasm for it, and their confidence."*** *(Central, C1, Y1)* • This can be expected to positively impact staff retention and career progression.
Improved teaching and pedagogy	• This is another very widespread impact (in 88% of schools of the survey), which we found to flow from increased enthusiasm and confidence. It was also a common impact stated in Y2 schools' action plans (39%). • Many schools saw impacts on knowledge and application of assessment, literacy, numeracy, exam preparation, and practical activity. • Impacts on practical learning were most often described in interviews and visits, even when teachers have not always have had the opportunity to apply the learning yet: ***"the advice he gave and quirky ideas about delivery and teaching things through practicals were useful… it just gave us a few extra ideas and a few tricks up the sleeve, and with that it does build confidence"*** *(NW, C1, Y2)* • Although as yet not widespread, there is evidence that this has improved supporting enquiry-based learning.
Increased subject and curriculum knowledge	• Often linked to the other two impact areas above, schools also commonly indicated that the support improved teachers' content knowledge, and knowledge of the triple science curriculum, including the new GCSE content/curriculum. 79% of schools in the survey, and 39% in the Y2 action plans, reported impacts. Particular improvements were found in teaching out of specialism, which, as described above, is important as recruitment and retention of specialist teachers was often noted as a challenge. ***"I think staff are much clearer on what TS is and how its delivered particularly those who haven't taught it before"*** (NW, C1, Y2)

[5] The methodology of reporting impacts in the Y2 action plan review was different from the methodology used in the survey; hence the consistent discrepancy in survey results being higher than the action plans. In the survey we asked teachers to rate the strength of each of the listed impacts, while the action plan review asked teachers to select only three most significant impacts in relation to teachers, students and school

Other impacts	• Improvements in **leadership and management** particularly to develop leadership skills for new heads of department to implement triple science. This was reported by around half of schools in the survey (56%), although it was far lower in the Y2 action plan analysis (9%), suggesting that this impact is harder to evidence immediately. • We found some impacts on **technicians**, mainly improved skills for practical learning, but technicians were not usually involved in the programme.

Impact on colleagues, departments, school capacity to provide triple science

We found good levels of impact on colleagues in and across departments and schools, with the strongest impact on the overall quality of teaching (78%), including sharing of practice and resources (77%) with increases in collaboration with colleagues in and across departments and schools and an increased capacity within the departments to teach triple science (72% of schools). There was improved leadership in around two thirds of schools, particularly because of the support from the advisors working with department and school leadership teams. The needs analysis and action planning process also supported schools with weaker science leadership, by providing strategic planning and improved management of CPD, particularly for triple science.

Figure 8 Overview of top TSSP impacts on colleagues/departments

Quality of teaching, sharing of practice and resources	• By far the most common impact, 78% of schools in the survey reported significant improvements in their quality of teaching, and it was also the top impact in Y2 action plans (54%); virtually all advisors also found this. • Schools incorporated new techniques, activities, and tools, saw improvements to their schemes of work/learning, and curriculum. "***As the teachers incorporate the strategies learnt, teaching and learning has improved***" *(DYHNE, C2, Y2)* • The TSSP catalysed improved sharing of effective practice and resources and improved collaboration between teachers, for instance through developing subject-specific groups, ***"because of the dialogue that goes with the support, between colleagues."*** (advisor) • We found this effect was also driven by improvements in staff enthusiasm and confidence.
Capacity to teach TS	• Schools in the survey (72%) and advisors (93%) identified high or medium impact here, but this outcome was lower in Y2 action plans (13%), potentially requiring greater time to unfold. • The support of the advisors helped schools to offer more effective triple science. ***"We are running Triple Science and weren't doing before, internal assessments indicate students are doing well and they enjoy it."*** (Central, C2, Y1/Y2) • The advisors supported schools to enable more students to take triple science, e.g. through improving curriculum planning, moving triple science to option blocks, and increasing curriculum time for triple science. The potential for, and achievement of, this type of impact is facilitated particularly in schools where SLTs have prioritised supporting triple science. • Support for teachers to teach out of specialism ***"allowing more teachers to teach triple science"*** (DYHNE, C1, Y1) helped improve schools' ability to offer it.

Leadership	• We often found good improvements to the leadership of the triple science curriculum (67% of schools in the survey, 17% in Y2 action plans) particularly through the advisors and networks. • Heads of science, especially new ones, gained increased confidence and strategies for responding to educational policy "***I am more confident in my role as a new HOD after hearing about others in the borough are dealing with change.***" (LSE, C2, Y1) • While not as pronounced, there was also impact on improved links between department leaders and the SLT.
Other impacts	• We noted positive effects on the **profile of triple science** within the majority of schools (57% in the endline survey, although only isolated reports in the Y2 action plans (4%), indicating that this impact takes longer to unfold. As a result of a "spotlight" being shone on triple science, SLTs were more aware of the issues, and students had better practical learning, more events, and triple science became an option open to all. ***"The profile of the school and of triple science within the school has definitely gone up because of the support."*** (Central, C2, Y1) • We found evidence of **improved team links and teambuilding** in a small number of schools.

<u>Vignette B: School 5 (Y2, C1)</u> had only just introduced triple science when the TSSP started, with a new head of science and a majority of staff that had not taught triple science before. Support helped the head of science prepare for the new GCSEs and improve leadership of triple science. It also helped develop staff skills in chemistry and biology, particularly for those teaching out of specialism. Practical activities, hinge point questions and other strategies helped improve staff's understanding of teaching the curriculum, and this is expected to impact students too. The head of science told us that: *"I think it's been a really valuable experience for the faculty and for me as a new head of science."* (More detail on School 5 is in Appendix 3).

Other impacts

Impacts on the whole science curriculum

We found good evidence of the programme having a positive impact on the teaching and learning for other science GCSEs, and also across the whole science curriculum, for ages 11-19, which were expected to bring gains for students in these classes too. The programme led to these impacts:

- **Directly**, many schools used the TSSP support to develop their teaching and curriculum at KS3, such as by rewriting schemes of learning, and by improving the link between their KS3 and KS4 curriculum. This was done in order to enable more students to make good progress and choose triple science in the longer term. One school reported ***"that's where the big***

impact will be – so we stretch and challenge lower down" (LSE, C2, Y1), which, it is anticipated, will lead to increases in triple science cohorts and their attainment.

- **Indirectly**, as individual teachers used different teaching approaches, practical activities, and resources gained through the TSSP to teach lessons across all key stages, including at KS3 and KS5.

In addition to the reported impact on student motivation to study triple science, there was also a reported **increase in student motivation to study other sciences pre/post 16**, and/or increase in actual uptake of science beyond GCSE level (46%). An advisor observed that: *"you're dealing with subject knowledge but also pedagogy. In one of my schools the support has increased numbers going into post-16. If you have confident and competent teachers you're going to get those outcomes."*

Improved collaboration on literacy and numeracy teaching across departments

Nearly half (45%) of schools reported that the programme benefitted their relationship with colleagues and improved cross-curriculum collaboration and learning, between departments, teams, or levels of management. The triple science CPD made teachers more aware of how they can work with colleagues in other departments, to share resources and insights, and integrate teaching and learning across different subjects.

- There is evidence of successful collaboration between science and mathematics departments to improve numeracy teaching and other skills required for triple science.
- We found evidence of other types of "cross-fertilisation", as science departments reached out, and shared materials and good practice from the programme, e.g. around how to approach differentiation, and literacy requirements. One head of department was pleasantly surprised by this, as ***"we didn't really expect to be able to take some of it off and train other teachers in other departments"*** (DYHNE, C2, Y2).

Impacts on schools' external relationships

This was less of a priority for schools, although a small number (16% of schools) noted positive effects on relationships with other schools or partners as a result of the TSSP. 70% of the advisors working with schools observed this in at least some of their schools, citing the role of the TSSP networking, and links they had arranged for schools with other bodies, such as the SLPs, awarding bodies, the Institute of Physics, and others; all of which we know schools appreciated. Schools described impacts from the TSSP on improving peer support, exchanging ideas, and general relationship building. Thus one head of department noted that "***as a result of being part of TS it has accelerated me being able to form positive relationships with other HoDs."*** (DYHNE, C1, Y1).

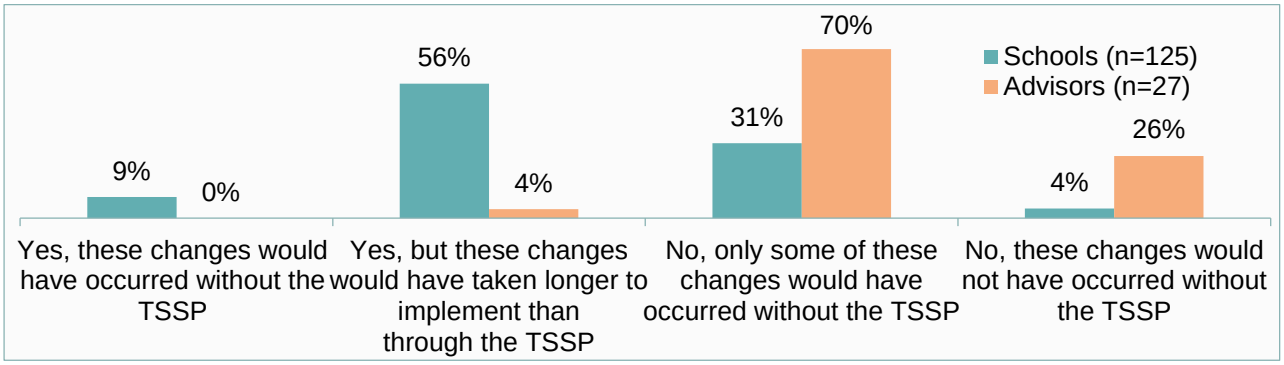
Attribution

It is clear that the TSSP had attributable impacts on schools' triple science provision. This can be characterised in two ways:

- The TSSP provided support for activities, and development for departments, that would not have been possible without it. One school noted that "***it's very difficult for us to get together as a full team, we wouldn't have had time to do that level of training otherwise***" (DYHNE, C2, Y1). Schools were clear that they would not have improved their provision to the same **extent** without the TSSP. Improvements in teachers' confidence were particularly attributed to the TSSP.
- The TSSP enabled schools to develop their triple science provision **more quickly**. School leads for the TSSP noted that developing these changes themselves would have taken much longer. It is reasonable to surmise that the TSSP helped targeted schools narrow the gap with their peers more quickly than without the TSSP: ***"We would have made progress – but it would have been slower and harder progress without"*** (LSE, C2, Y1)

A small number of schools we spoke to considered their triple science provision before the TSSP as strong, viewed their staff as fully committed, and thought they were determined to look for support elsewhere had the TSSP been not available. Nonetheless the TSSP was still credited with helping them to gain greater clarity and enthusiasm for developing triple science. Unsurprisingly, the advisors were much more vocal in crediting the programme and attributing the impact to it: all stated that that the support from the TSSP, which they delivered, enabled schools to make more changes, more quickly, and more effectively.

Figure 9 Extent to which positive changes would have occurred without the TSSP, from endline surveys



Sustainability and ongoing barriers

Evidence for schools' positive changes in triple science provision suggests that sustainable impacts have already occurred. Supporting this view, the vast majority of advisors were confident that the impacts resulting from the TSSP are 'very' or 'quite' sustainable.

However, it is important to distinguish between the different types of impacts. Thus, while we most often found improvements in teachers' enthusiasm and confidence, these were characterised as quick gains, and conversely are more susceptible to dissipating quickly and are reliant on individual colleagues.

As positive outcomes on teachers and departments are the pre-requisite for the achievement of student-level outcomes, it is vital to sustain and build on the impacts that are already evidenced for teachers and departments. These can be challenging. For example, more than half of schools (53%) reported **staff turnover** to be an issue. One school described in their reviewed action plan how ***"Staff shortage continues to hinder progress. Despite this quality of teaching improved and assessment is more robust."*** (Central, C1, Y2). Although we know that teachers do take the individual benefits from the TSSP with them when they change schools, for schools in the programme this has limited the teachers who benefited, and can disrupt impact.

Department-level changes (e.g. changes to curriculum including at KS3, resources, approaches to selecting and timetabling for triple science) are less susceptible to instability at the individual level but nonetheless require maintenance and renewal in order for such outcomes to be embedded. We found that just over half of the schools (58%) admitted that they needed to do more to **embed the positive changes** but it was challenging due to limited staff time to implement, evaluate, and adapt. This links back to prioritisation, including the support of the SLT; and also the need to adapt to wider educational changes.

> ***"We will be trying to implement some of the activities and ideas we've learnt. The problem with training sessions is now having enough time to evaluate what we're doing at the moment and then further improving what we're doing because we have so many new initiatives at the moment – new A2, new AS, new GCSEs so we have a lot of curricula change."*** (DYHNE, C2, Y2)

Sustainability of the impacts of the programme need to be maintained by **ongoing elements of support**, i.e. those provided through the TSSP (networks, online support); and other partners, organisations or sources of information, which we know schools were linked to or made aware of by their advisors. For instance, an advisor suggested that schools need ***"a means for regular consistent information to reach teachers; almost all are now registered on the STEM elibrary so this seems the logical way forward."*** As such, the sustainability of the impact of TSSP will be dependent in part on how far schools continue to make and embed the improvements, engage with networks, online support, and other avenues of support.

To support this, future programmes should consider longer support cycles for schools and more follow-up; maintaining effective links with SLPs, the networks of excellence, and other structures of support; and include a strategy for embedding the use of the online resources available.

5. How well has the programme met its aims?

Overall delivery model

Overall, the TSSP delivery model has been successful in achieving the programme outcomes and impacts. It provided high quality support to schools, with the model features overall and the specific elements generally all receiving positive ratings by majorities of schools (between 98% and 62%, for different elements in the survey, and good qualitative feedback). Formative evaluation provided throughout the programme was beneficial in addressing problems and acting on feedback collected from CPD providers and school recipients. For example, in the first year of the programme schools were contacted in September, a busy period, and limited the time in which schools could receive support (although this was mitigated by advisors working flexibly to accommodate the needs of individual schools). This improved with the programme adjusting to an earlier start in contacting schools in year 2.

Looking at particular aspects of the model:

- Schools highlighted that a key feature of the TSSP's success was the **availability of fully funded support**. Without this, schools indicated that they would simply have been unable to obtain that level and quality of support. In the context of schools' current limited CPD budgets, the TSSP was a rare opportunity for many schools to source and fund CPD, especially departmental CPD, which they would otherwise have struggled to fund and support. The availability of additional funding to provide cover for teachers to engage with the programme, in Year 1 of the programme, was another particularly beneficial element.

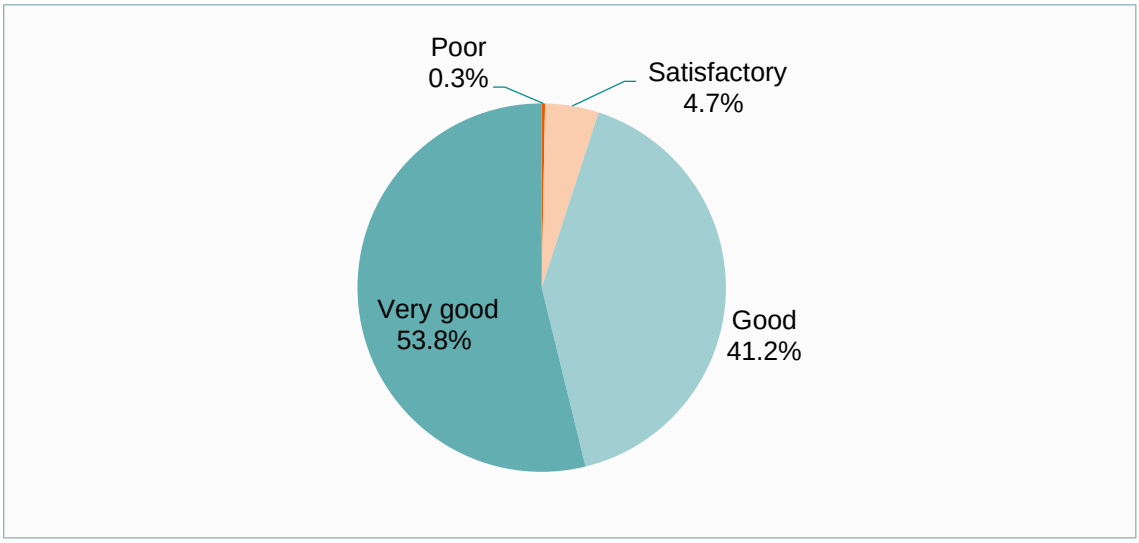
- The **bespoke and flexible nature of the support** was another key aspect of the TSSP's effectiveness. A key success of the model was having well-informed specialist educational advisors to support schools through the TSSP process, including in the needs analysis and action planning; as well as in the bespoke CPD. All these enabled schools to be much clearer about the types of support they need and also enabled subsequent support to be tailored to schools' individual needs, which schools valued highly: ***"It's much better that [our advisor] is actually looking at our school … We have different problems to others so if they did the one size fits all then that's not right."*** (DYHNE, C2, Y2). Some characterised this in terms of the flexibility of the support content on offer: ***"that flexibility for me has been the key thing in terms of making it successful."*** (Central, C2, Y2)

- Advisors valued the **support and management of the programme** from STEM Learning and the network of Science Learning Partnerships: "***one of the real strengths of the project is how it's been managed***" (Regional Lead)

Comparison of individual elements

Internal evaluation data[6] shows very positive views on the quality of the CPD provided. Looking across the different elements (other than the online support), schools reported that the overall quality was very good, as shown in Figure 10 below. Vast majorities (between 92% and 100%) of participants from schools stated that the CPD was well organised, delivered, relevant, and impactful, and that it met their own objectives and priorities.

Figure 10 Overall Quality of CPD, from internal CPD evaluation, Dec 2014 – Mar 2016 (n=340)



In our own evaluation activity we also found good feedback on the different elements of support. Comparatively, we found the bespoke elements (overall support provided by each schools' individual advisor, the needs analysis/action planning process, and bespoke in-school courses, coaching and CPD) were most effective. This is not surprising in light of the range of targeted schools' different starting points, making support tailored to their own particular needs invaluable.

- **The overall support from the school's individual advisor was rated as the most impactful** and valued type of support for schools (in the survey, 98% of schools indicated this was helpful in improving their triple science provision, of which 67% said it helped 'to a great extent'). Their value was in being an external expert with the knowledge, experience, ideas, and time to support schools develop their triple science provision, and science in general.

[6] Based on STEM Learning's analysis of a 400 sample of evaluation forms returned through the programme, either in paper form or electronically, via the Impact Toolkit or BOS tools. These evaluation forms covered a full spectrum of CPD offered to schools, including in-school bespoke CPD, network meetings and scheduled CPD courses

- **Bespoke school based courses, coaching and other CPD** (provided through advisors and regional operators) were **also highly rated and effective** (96% stated it was helpful, of which 67% said it helped to a great extent). This element was also seen as "***more hands on***" (Central, C2, Y1) and enabled more staff in the target schools to be involved. This CPD supported schools with practical learning, revision strategies, assessment, subject-specific CPD, and opportunities for whole faculty discussions and development. It also included tailored support for schools to help develop their overall capability to provide triple science: for C1 schools, advice on how to go about offering it in the first place; for C2 schools, how to develop it (e.g. offering it as an option, increasing uptake).

- **The needs analysis/action planning process** (which advisors supported schools to complete) was **valuable for many science departments with weaker strategic planning**, which needed additional support in auditing their resources and CPD needs. It enabled them to diagnose and address effectively the needs of the faculty and individual staff, creating a plan of action for TSSP support. Departments that were stronger in this respect still benefitted from being reminded of existing needs and solutions to improve their triple science teaching.

- **Scheduled external CPD courses** were also seen as **helpful, but to a lesser extent** than the bespoke forms of support. Where these were effective they helped schools through discussions with other schools about issues around triple science, as well as improved pedagogy and learning new skills and general networking.

- **Networking** provided useful opportunities to share good practice, resources, and ideas; to discuss issues and strategies around triple science provision; for mutual support; and to stay abreast of curriculum changes, which was helpful for new heads of science in particular. The attendance of universal schools, and/or mixing between technicians and teachers were also beneficial. They also provide an element of **continuity**. However, **uptake and effectiveness of these was lower.**

- **In comparison to other elements, online resources were reported by schools as the least used and the least effective.** The school action plans recommended all staff sign up to these, although we found that in practice teachers' direct access of these was limited (44% indicated they did access these). Teachers' time constraints were the biggest barrier to their direct engagement with online resources. However, some of these resources were offered to schools in bespoke and scheduled CPD sessions, so sometimes schools were engaging with the online resources without directly accessing the online collection. It is instructive to note, in this context, that a vast majority of schools (93%) rated the general resources available from the programme as 'good' or 'very good'. This would include the online resources they accessed as well as those provided to them by their advisors, in courses and at meetings.

- Those who engaged with resources online report the the Self Evaluation Tool and the eLibrary resources as the most helpful to improve teaching and learning. 18% found this helped 'to a great extent' and 74% that it helped 'somewhat'. Qualitatively, we found that resources for assessment and practical learning, and the Self Evaluation Tool, were particularly in high demand and were reported as being used to improve teaching.

- It must be noted that a **new, upgraded version of the STEM Learning website** was launched in December 2015; so schools (particularly schools in year 1) may not have accessed the new website. This is supported by the evidence that levels of use and perceived effectiveness were higher among schools in year 2.

Links to wider network of Science Learning Partnerships (SLPs)

STEM Learning's delivery of the TSSP has offered **great potential for schools to benefit from the links** to the wider network of Science Learning Partnerships. A number of schools received other CPD through the SLPs, at the National STEM Learning Centre in York, and online, which 90% found was 'very good' or 'good'. Schools were being linked to other SLP meetings; leveraging other CPD and triple science activity and budgets. The TSSP offer was seen to support the work of regional operators and SLPs.

There is, nonetheless, **room for improvement, as the two structures did not yet link perfectly.** Advisors' awareness and understanding of this wider offer was a crucial link for schools, but this was limited in some cases, and meant the work was not as collaborative as it could be. Other areas for improvement included: communication with SLPs; more clarity for schools about the role of the SLP; and better meshing of the two, such as building TSSP into the SLPs offer, and vice versa, to support their outcomes.

6. Recommendations

Future needs

Across the various data sources for this evaluation, we heard schools express an appetite for further support with their triple science provision. For many this was simply a case of receiving **more support in general**. Looking at specific support needs, a key theme we found was around the **new GCSE specifications** which schools consistently noted as a priority. This was related above all to developing schemes of learning for the new specifications (69% of schools in the survey requested this); or understanding the new GCSEs in the three individual subjects (53% to 51% of schools). We know that the majority of these specifications have recently (March 2016) been released, but there does appear to be further room for supporting schools that have not yet done so to change their delivery of the content and pedagogy for these. Other top preferences for further support were for raising attainment (59%); physics for non-specialists (56%) and strategies for underperforming groups (52%).

Recommendations for future projects

- The **model of using allocated advisors who are educational specialists to support schools through the CPD process, and the availability of bespoke in-school support**, have been the most effective parts of the TSSP and should be considered as key components of delivery models aimed at building capacity and competence to deliver professional development support. Flexibility in the content and scale of support on offer are key.
- Programmes need to **recognise and formally engage with the senior leadership teams** as they are crucial in creating supportive environments for development.
- **Delivery cycles for programmes of school support need to be longer and coordinated to schools' own timetables**, starting with the school year and spread across at least a whole school year, and up to two. This would assure the greatest impact and help schools embed and internally disseminate changes, and then to review and build on these.
- Now that the Science Learning Partnerships are more established, the provision of professional development needs to **clearly identify how to join up most effectively with the local SLPs and other structures** to achieve the greatest added value for schools.
- Online resources can provide a valuable component for programmes of school support; however, such programmes need to build in a **strategy and time for schools to familiarise themselves with online resources, in order to maximise uptake and impact**.
- In order to achieve further widespread gains for **students on pupil premium/other vulnerable groups**, programmes need to build in support targeting these as **an element of all development packages** for schools where it is appropriate.