1 Executive summary

This is the final report on the evaluation of the Capital Physics programme.

1.1 Background to the programme

The Capital Physics programme was funded by the Greater London Authority (GLA) and managed by the Institute of Physics (IOP). The programme is London-based and aimed to improve attainment in A-level physics in London schools. Drawing on the experience of the IOP, it aimed to facilitate the establishment of sustainable school-led continuing professional development (CPD) networks based on a hub model, with six ‘advocate schools’ supporting physics teachers in 60 ‘partner schools’.

The programme started in the summer term 2014 and ended in July 2015. As at end of July 2015, there were six advocate schools and 60 partner schools taking part in the programme.

1.2 Focus for this report

The focus of the report is to identify whether there is evidence to suggest a change, or not, in teachers' pedagogy when teaching physics, as a result of engagement with the programme. In addition, it defines the key ‘enablers’ and ‘barriers’ to A-level physics participation and progression from AS- to A-level physics as perceived by strategic leaders in the six advocate schools and confirmed by partner schools.

1.3 Data used in this report

The following data has been used in preparing this report:

- A baseline survey of partner schools. At least one teacher responded from each of 36 (61%) partner schools
- A follow-up survey of partner schools. At least one teacher responded from each of 38 (63%) partner schools
- Telephone interviews with the 6 advocate schools and 40 partner schools
- School performance data (Department for Education: http://www.education.gov.uk/schools/performance/download_data.html)
  and directly from partner schools via email or telephone

Findings from the initial survey were intended to offer a baseline indicating initial changes planned or implemented by physics teachers as a result of the programme interventions.
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The survey conducted at the end of the summer term 2015 compares the early responses with changes reported at the end of the programme as a result of involvement with the Capital Physics programme or other support networks.

1.4 Key messages

1.4.1 Changes to pedagogy

Across both the autumn 2014 and summer 2015 surveys the majority of respondents said they had taken part in at least one of the Capital Physics support activities listed and respondents were most likely to have participated in CPD sessions held at their own school.

Where respondents indicated that they had not yet taken part in a specific activity but planned to do so, they were asked to describe what they hoped to gain from their participation in the activity. There was an interesting shift in focus evident among the responses given between the autumn 2014 and summer 2015 surveys: in the earlier survey respondents were most likely to state that they were hoping to improve their teaching of A-level physics as well as increasing take-up and attainment, whereas those who answered this question in the summer 2015 survey were more likely to have their sights set on the new A-level physics specifications and were hoping to receive support and share ideas on the delivery of the new specifications (particularly for the practical elements).

When asked to describe any changes they had made or were planning to make to their teaching practice following participation in Capital Physics activities, 33 of the 41 respondents to the autumn 2014 survey and 42 of the 44 respondents to the summer 2015 survey described at least one change. When asked which Capital Physics activity had contributed the most to the changes in teaching practice, CPD sessions or workshops at their own school was the most frequently cited contributor to the changes across both surveys. The most frequently cited change in both surveys was better use of practical work or activities during classes (mentioned by 13 respondents in 2014 and 18 in 2015) followed by changes to the teaching of specific topics (five respondents to the 2014 survey and seven to the 2015 survey mentioned this) and better use of demonstrations in class (a change made by four respondents to the 2014 survey and seven who completed the 2015 survey).

In the autumn 2014 survey, around half of respondents who described a change said it had already been made, while the remaining half were planning to make the change. In the 2015 survey, approximately two-thirds of changes described had already been made and a third were still being planned. When asked whether they had experienced or could foresee any barriers to implementing these changes, in the 2014 survey approximately one in three said yes while in the 2015 survey around a quarter said yes. Across both surveys the two most
commonly given descriptions of these barriers were a lack of time and/or a lack of specialist physics equipment. In the summer 2015 survey there were also concerns expressed by two respondents over the expertise and abilities of science technicians at the school to support them in implementing their planned changes.

Respondents were asked to identify up to five criteria they might use to determine whether students are engaged in their physics learning and against each, to indicate the extent to which they believe their involvement in Capital Physics has impacted on levels of engagement. In both surveys improved attainment (as measured by external and/or internal exams) was the most frequently cited engagement criterion, followed by greater take-up of GCSE and/or A-level physics. While in the autumn 2014 survey respondents’ views on the extent to which Capital Physics activities or support had affected these engagement criteria were mixed, in the summer 2015 survey there was a notable shift in the attribution of impact for certain criteria, most notably attainment, take-up of physics, student voice, independent learning outside of the classroom and students’ interest/engagement in the work. All these criteria were more likely to achieve higher ‘impact scores’\(^1\) in the 2015 survey than they were in the 2014 survey. In the 2015 survey, some criteria received a lower ‘impact score’ than they did in the initial 2014 survey. This suggests that in the baseline survey in autumn 2014 there was evidence of impacts of the programme on the more ‘immediate’ engagement criteria such as improved practical skills, engagement in extra-curricular activities and demonstrating better understanding, while in the summer 2015 survey a more notable impact was evident in those engagement criteria that take a little longer to embed and show through as positive changes such as attainment, home learning and student voice.

In the summer 2015 survey only, respondents were asked how the programme has affected their understanding of how students can access and achieve grades A-A*. Respondents described a range of enhancements in this area but the most frequently cited impact of the programme here was in improving teachers’ understanding of teaching to achieve higher grades and improving practical skills which in turn can be important in aiming for the highest grades.

In their descriptions of the overall outcomes of the Capital Physics programme on them as teachers, respondents mentioned a wide range of benefits across both surveys. The most frequently cited of these was the provision of new ideas and approaches to teaching physics.

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\(^1\) The ‘impact score’ is a measure of the contribution respondents felt the Capital Physics interventions have had on the specified engagement criteria. The scores ranged from 0 corresponding to ‘no impact’ to 6 corresponding to ‘very significant positive impact’. Average ‘impact scores’ were calculated to give an overall indicator of how far the programme has contributed to increased pupil engagement in physics.
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(mentioned by nine respondents in 2014 and seven in 2015), followed by the benefits
afforded by the links with other schools such as sharing good practice (eight respondents
mentioned this in both surveys). Three respondents in 2014 and seven in 2015 said their
confidence in teaching physics had increased as a result of their involvement in the
programme and six respondents in 2014 and five in the 2015 survey said a key change had
been in their use of practical work in their teaching. The number of respondents who said
that the programme had supported their preparations for the new A level physics increased
from one in 2014 to four in 2015 suggesting that as the implementation date approaches,
this form of support has been particularly valuable.

When asked to what extent the Capital Physics activities and support they have received so
far have met their needs and expectations, in both surveys the majority of those who
responded indicated that their expectations had been met or exceeded. In their comments
several respondents praised the support received from their coach and/or the CPD activities
provided by their advocate school and in the 2015 survey five respondents praised the
extent to which the support received can be tailored to the needs of individual schools and
teachers. In the 2015 survey several respondents described the help and support they had
received in the practical aspects of teaching physics including training in using equipment
and four respondents were appreciative of the quality of support received in preparing for the
new physics A level. Only eight respondents to the 2015 survey and three to the 2014
survey made either a negative comment or suggested improvements to the programme.
These comments addressed a range of issues but tended to refer to the quantity rather than
the quality of support available.

In the 2015 survey the most frequently requested types of support that respondents said
they would like but had not received from their Capital Physics involvement were the
establishment of local support networks between physics teachers (i.e. extending this
beyond participating schools), more teaching resources, financial assistance and training
aimed specifically at non-specialist physics teachers.

All but one respondent to the 2015 survey stated that they were likely to continue to engage
in CPD relating to their physics teaching once the programme ends and just over two-thirds
said they would continue to engage with the network of physics teachers they have got to
know through the programme after it finishes.

In their further comments and suggestions on the Capital Physics programme, most of the
comments made in both surveys were of a positive nature and praised the quality of support
and usefulness of activities provided. Five respondents to the 2015 survey and one to the
2014 survey suggested that the programme should be extended beyond one year, and those
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who commented on this topic in the most recent survey tended to justify this request with reference to the support needs related to the introduction of the new physics A-level specifications. Three respondents to the 2015 survey asked that the networks and sharing of good practice are continued beyond the end of the programme and suggested that these are expanded to include non-participating schools.

1.4.2 Participation and progression

Five factors were identified as key influencing variables on pupils’ participation in A-level physics and progression from AS to A2, based on interviews with 6 advocate and 40 partner schools. The five factors can be summarised as follows and are presented in rough order of prevalence:

1. The level of dependency (perceived by the pupils) between achieving a full physics A-level and the chances at gaining the university place of choice and/ or fulfilling their career aspirations.
2. The level of pupils' innate interest in, passion for and enjoyment of physics during and especially towards the end of key stage (KS) 4.
3. The extent to which pupils perceive physics as a practical subject bearing relevance to their life now and in the future as well as to ‘how the world works’.
4. The level of competence and enthusiasm of the physics teaching staff at KS4 and KS5.
5. The extent to which pupils have gained a good result in GCSE physics and maths, choose maths at A-level and do well in AS maths. Where any or all of the above factors are present, pupils are likely to choose physics as one of their A-level subjects and progress from AS to A2 physics.

1.4.3 School AS and A level physics attainment

- Of the 49 partner schools who responded to requests for summer 2015 attainment data, 35 (71%) showed an increase in their average UCAS point score compared to summer 2014 AS results.
- Of 42 partner schools who reported summer 2015 A-level attainment data, 23 (55%) showed an increase in their average UCAS point score compared to summer 2014 A-level results.

It should be noted that the analysis did not take into account any difference in the student cohort between the academic years in terms of, for example, students’ prior attainment or other background variables and therefore findings should be treated with caution.