Improving Science Education

Application Form Guidance Notes

Grants Round: Improving science outcomes and progression for students aged 5 - 16
(Closing date: 9th April 2018)

The EEF and Wellcome are seeking proposals for educational interventions that aim to improve the science attainment and/or progression of disadvantaged pupils. This is a call for proposals as part of a multimillion pound funding programme that will support work both in and out of schools, including CPD programmes for teachers, resources and curriculum programmes, external experts running programmes within schools and also pupils accessing external enrichment activities coordinated by their school.

The EEF and Royal Society conducted a literature review that analysed the current science attainment gap between disadvantaged pupils and their more affluent peers, identified possible reasons for the attainment gap and also reviewed the existing evidence about what works for improving outcomes. This funding round aims to further fill gaps in the existing evidence base by funding and evaluating promising interventions, programmes and approaches designed to improve the attainment and progression of this group of students.

The aim of this funding round

The attainment gaps in science between disadvantaged pupils and their more affluent peers are large. Pupils that are eligible for pupil premium funding (FSM pupils) are around 2.5 times less likely to achieve level 2 at age 7 and level 4 at age 11 than pupils not eligible for this funding. This attainment gap grows larger with time and FSM pupils are around three times less likely to be entered for the EBacc in science, and also achieve science scores that are 0.63 standard deviations lower than non FSM pupils – this represents a difference of eight months’ progress. Attainment gaps post-16 are largely driven by poor attainment at GCSE and low numbers of FSM pupils progress to study science post-16.

One clear conclusion from these data is that the main barrier to participation in science for disadvantaged young people is poor prior attainment. If approaches can be identified which successfully boost attainment this barrier can be reduced, enabling FSM pupils to access science study post-16 and also the vast range of careers that a science qualification facilitates entry to.

Supporting information

The recent review commissioned by the EEF and Royal Society can be found here. The review identified some promising approaches and gaps in the evidence:

Promising areas that projects could address:

- Opportunity gap – whether FSM pupils have access to the same resources to be able to learn science
This includes both opportunities provided at school and at home. FSM pupils have access to fewer resources and experiences outside of school. Ensuring that FSM pupils are therefore provided with the opportunity to access science experiences and resources through their school may therefore be one way of closing the attainment gap. This could include trips or projects within the school.

- **Scientific reasoning – being able to plan scientific experiments and understanding how to judge the value of experimental results**

Scores on scientific reasoning tasks correlate highly with scientific attainment and are also good predictors of future success. Evidence also suggests that children from more affluent backgrounds do better than those from less advantaged families on tests of scientific reasoning. In addition scientific reasoning appears to be malleable, with intervention studies testing approaches that teach children about planning scientific experiments and interpreting data showing impacts on scientific reasoning tasks. Projects that aim to improve scientific reasoning could therefore be a good way of closing the attainment gap.

- **Literacy and science learning – the role of literacy in science attainment and progression**

There is a positive relationship between scores in reading and spelling tasks and science attainment, again these scores are also good predictors of future success. Several possible reasons for this relationship have been suggested, including pupils being able to understand what they read in science lessons (which often includes complex and unfamiliar words, requiring knowledge of morphemes and how different scientific words relate to each other) and also reading comprehension having features in common with science understanding such as creating coherent arguments and making inferences. Current evidence therefore suggests that science programmes that integrate literacy into science lessons are likely to be positive.

- **Metacognition and science learning – pupils’ understanding of how they think, remember and learn science**

Some evidence exists that indicates a link between metacognitive abilities and science attainment. There are also intervention studies that indicate metacognitive interventions impact on attainment and potentially impact on pupils with lower current attainment to a greater extent. These include getting pupils to reflect on the standard of work completed in science lessons and also providing instruction around control of variables, forming hypotheses and applying conceptual models to new contexts. There is therefore some evidence of promise that metacognitive interventions could help to address the attainment gap.

In addition, the Wellcome Trust recently published their results from the Science Education Tracker (a nationally representative survey of more than 4,000 students between year 10 and year 13 in state-funded schools across England) this highlighted several areas that we would be interested in, including: increasing the amount of quality practical work, increasing the opportunity to take part in quality work experience, and improving gender parity in confidence and progression in science.

In all of these promising areas the available evidence is relatively sparse and therefore more can be learnt under each area. **In addition there may be promising evidence outside of these specific areas and we would also welcome applications outside of these areas as long as there is evidence of promise that the programme is likely to impact on attainment and / or progression.** More information on levels of evidence can be found below.

**Project criteria**

Successful proposals will:
• Focus on raising the science attainment and/or the progression of pupils within the age range 5-16 in UK schools. We are particularly interested in approaches that seek to improve the attainment of disadvantaged learners (pupils eligible for pupil premium funding) and would expect applicants to be willing to work in challenging schools. The progression of students is likely to focus on progression to study a science A-level or other post-16 science qualifications.

• Be informed and supported by encouraging evidence of an impact on attainment and progression. If available, evidence of the impact of the approach being proposed should be provided. Please refer to the Sutton Trust and the EEF’s Teaching and Learning Toolkit and the recent review “A review of SES and science learning in formal educational settings”, both available on the EEF website as a starting point.

• Be practical, appropriate, affordable and scalable. Our aim is to identify interventions and approaches that, if shown to be successful, could be taken on by other schools. Therefore we are only interested in testing initiatives that are practical and affordable for schools. We also need to understand what training and support is needed so that schools and teachers can use the intervention effectively.

• Be willing and able to be independently evaluated. We will rigorously evaluate the impact on attainment and, if appropriate, impact on progression of the projects, wherever possible by randomly allocating which schools or pupils receive it. We will appoint an independent evaluator, and work with successful applicants to design an appropriate evaluation plan. Note that this does not need to be included in your project plan and budget.

• Be led by a project team with expertise in the relevant areas. For example, the team should have experience of delivery with teachers, or within schools. Ideally, the team would include someone with extensive teaching experience. We welcome applications from a variety of organisation including, schools, universities, charities and for-profit organisations.

Type of projects

We are interested in projects that are either:

• Testing the impact of a fully developed intervention through a randomised controlled trial (with the evaluation aspect designed in collaboration with the independent evaluator). For this to be applicable the intervention would need to have been previously been delivered in a number (at least 10) schools and be fully developed in terms of the resources and training required. There would also be clear descriptions of what good fidelity to the intervention looks like and evidence indicating that the programme is likely to impact on attainment. An example of an existing EEF project that met this criteria is Thinking, Doing, Talking Science, which had previously been evaluated in 16 primary schools through a match study. In addition there was background evidence that supported the rationale for the programme.

• Testing the feasibility and collective evidence of promise of a more developmental project through a pilot evaluation (again, with the evaluation aspect of the project being designed in collaboration with the independent evaluator). For projects to be suitable for this funding they would need to have evidence (from the literature) supporting the rationale the approach and why we would expect this to lead to the intended outcomes. They would also need to demonstrate the need for the project and that they are not re-developing something that already exists.

Your proposal

We do not have a set minimum or maximum size of grant that we award. Past grants have ranged from £90,000 to £1.5m, with the rest somewhere in between: we spend as much as we have to, but not a penny more than we need to, in order to trial projects we think can improve attainment outcomes. We will work with successful applicants (and the independent evaluators) to decide the scale required for a robust evaluation, but we would expect it to be delivered in settings the applicant hasn’t previously worked in. Therefore in the initial application form, we require only an indication of the scale of project you wish to deliver, and its estimated cost.
Timeline for decision-making

EEF and Wellcome will review applications and we plan to have a decision about funding in September 2018. We anticipate that most projects would start delivery in schools in September 2019 as this allows time for development and recruiting schools. A more detailed timeline, including some key dates is below:

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tr>
<td>Science Education Research networking event (York)</td>
<td>13th February 2018</td>
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<tr>
<td>Science Education Research networking event (London)</td>
<td>15th February 2018</td>
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<tr>
<td>Application deadline</td>
<td>9th April 2018</td>
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<tr>
<td>Review of applications by EEF, Wellcome and external reviewers</td>
<td>By 31st May</td>
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<tr>
<td>Invitation to interview (A maximum of four team members will be able to attend)</td>
<td>14th June 2018</td>
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<td>All applicants informed on the outcome of their application</td>
<td>End of June 2018</td>
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<tr>
<td>First stage sign-off for successful projects</td>
<td>End of June 2018</td>
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<td>Meeting with independent evaluator (During this time you will be paired with an independent evaluation team. You will be required to attend at least one set up meetings at the EEF where you will work will work with EEF/Wellcome and the evaluation team to finalise the experimental design and evaluation methodology. During this time you will need to develop more detailed and updated budgets based on the decisions made.)</td>
<td>July – August 2018</td>
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<tr>
<td>Final sign-off for successful projects</td>
<td>September 2018</td>
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<tr>
<td>Second meeting with independent evaluator</td>
<td>October 2018</td>
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<td>Grant agreements signed</td>
<td>December 2018</td>
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A key date to note is the 14th June, which will be the day of interviews for shortlisted applicants, the interview will be held in London at the Wellcome Trust and more details will be provided should you be invited to attend. If you are not invited to interview this doesn’t necessarily mean that you are unsuccessful. All applicants will have heard the outcome of their application by the end of June 2018.

Networking Events for Science Education Research

The EEF and Wellcome will be holding two events (in London and York). These events are intended as an opportunity for you to meet people (researchers, teachers, informal practitioners etc) who are interested in improving the outcomes of young people in science. We hope the conversations and knowledge exchanges between participants will lead to new ideas and collaborations for testable interventions suitable for this round or further rounds. More information about the events can be found here.

How to apply

To submit an application please register for the round via the EEF website and complete the online form. Try to minimise the use of abbreviations and acronyms to avoid any confusion for the reader; define them.
when they are first used. Keep technical jargon to a minimum. Following the closing date, Wellcome, EEF and external reviewers will review the applications received against the project criteria as defined above.

For further information, please contact Emily Yeomans on emily.yeomans@eefoundation.org.uk, or Lia Commissar on l.commissar@wellcome.ac.uk.
Eligibility criteria
Do you intend to implement this project in school settings, or in informal setting, but with the opportunity facilitated through schools in the UK?

- Please note that we are open to innovative ideas from both within the UK and overseas that are applicable to the UK education system. As EEF can only fund projects in English schools we would expect at least part of the project to take place in English schools, however Wellcome funding would allow for some schools from other parts of the UK to be involved.

Are you applying for an independent evaluation of your fully developed intervention or funding to test the feasibility of a more developmental project through a pilot evaluation?

- We are not a source of funding for ongoing delivery of existing programmes. If successful, you will be required to work with new settings that you have not previously worked with, and to collaborate with an independent evaluation team who will work with you to design a robust evaluation.

Are you applying to deliver your intervention in more than one school or setting?

- We do not fund projects in one or very small numbers of schools/Settings. Our smallest projects have been in 3-4 schools, but are typically in more than 50, and often over 75, institutions. As detailed in the guidance notes we are interested in testing fully developed interventions through a randomised controlled trial, these interventions would need to be delivered in more than 50 schools. We are however also interested in more developmental projects and these are likely to take place in 10 – 15 schools. Projects do not need to have identified schools before applying and recruitment criteria will be developed with the independent evaluator prior to schools being approached.

Section 1: About the project
1.1 Project title (max 15 word)

- Please give your project a title. Simple, descriptive titles (e.g. “Peer-tutoring in the North-East” or “Mentoring project for Year 7s”) are welcome. If funded these titles may change in discussion with the EEF and Wellcome.

1.2 Please state the main research question that you expect the evaluation of your programme to answer. For example, ‘Does training teachers in how to use formative assessment lead to improved science GCSE results?’

1.3 Which key stage are you targeting?

- Please select the main key stage focus of your intervention:
  - KS1, KS2, KS3, KS4

1.4 Is your project: whole school / whole class / targeted intervention?

- Please give an indication of whether the intervention is aimed at whole school change (e.g. training all teaching staff); whole class (e.g. training teachers to improve their classroom practice); or a targeted intervention (e.g. additional small group support for struggling pupils, or support for parents).
1.5 Who will deliver the intervention?

- Please select from: Teachers/Teaching Assistants/External staff/Other
- Please select who will be directly responsible for improving outcomes for pupils. For example, if a teacher receives coaching to improve their practice, please select “teacher”, not “external staff”

1.6 Please outline your proposed project. Please focus on the intervention, including the specific activities that, e.g., schools, teachers and pupils will be expected to do. (maximum 400 words)

- Please give a clear, simple description of what your project will do. What would it look like from the point of view of a participating school/setting?
- Please ensure that within your answer to this and other questions, you have answered the following:
  - Why? The rationale for the intervention. You can assume that we have some understanding of the broad issues facing disadvantaged pupils, but any details specific to your intervention – e.g. specific language deficits – should be explained
  - Who will benefit from the project (the ultimate recipients – e.g. all pupils in the year or targeted groups?)
  - What? What materials (e.g. structured activities for TAs) and practices (e.g. class teaching pedagogies) will be introduced/altered in order to try to improve outcomes?
  - Who will deliver the materials and practices? Will it be teachers/TAs or external experts? How often will they use the approach (e.g. weekly sessions)?
  - Who will train the teachers/TAs in the approach? How will this happen?
  - What ongoing support will there be?

1.7 How much time and resources are required to implement your intervention? (maximum 200 words)

- For example, how long does the initial training take? What preparation is required before this? How is the training delivered? What is the frequency of the intervention (e.g. weekly 30 minute sessions)? How long does the delivery of the intervention last (e.g. one term)? How much does the training cost?

1.8 What is the evidence for the principles behind the programme? (Maximum 200 words)

- What is the evidence that the content of the programme is likely to improve the attainment, skills or progression of disadvantaged pupils? Are the approaches and pedagogies backed up by robust educational theory and research?
- For example, this could include evidence for a particular pedagogy (e.g. feedback), drawing on wider international research about its impact.
- Evidence from the Teaching and Learning Toolkit could be a starting point, as well as the recent review commissioned by the EEF and Royal Society and the Wellcome Trust Science Education Tracker. We do however expect the strongest applications to have more detailed justifications and to draw on other evidence sources.
- Please provide links to the most relevant research articles. Short references are sufficient.

1.9 What is the strongest evidence that the proposed programme has an impact on attainment, or progression?

Please select from:
i. Randomised controlled trial
ii. Quasi-experimental design trial (e.g. matched control)
iii. Pre- and post-test data
iv. Case study data

1.10 Please describe the evidence for your programme’s impact on attainment and/or progression (maximum 300 words)
- Please include information about the sample size, outcome measures and key findings of any evaluations completed, and provide links/references to any evaluation reports cited.
- Wherever possible, please show evidence that children who participate in the proposed project (or something similar) improve relative to a comparison group of similar children who do not participate.
- References to the wider literature should only be used to support the specific approaches that you’re suggesting, for example showing that a very similar intervention had a positive impact when tested using a robust methodology. This evidence could be drawn from international studies.
- More information about what the EEF considers to be good evidence can be found on the evaluation section of our website.

1.11 If the proposed project has been implemented previously in the UK, please describe its reach and impact, and the cost so far. (Max. 200 words)
- We are interested in how developed the project is and what its reach and impact has been to date. How many UK schools/settings have participated so far?
- We are most interested in projects that have been delivered to some extent already, and therefore do not require extensive development before piloting or testing in large numbers of settings.

1.12 If the proposed project were to be funded by EEF and Wellcome and a positive impact were found, what do you think are possible ways that the proposed intervention could be taken to scale? (Max. 100 words)
- We are interested in how your intervention might be scaled up so that it could be delivered in large numbers of schools in England.
- For example, does the lead organisation have the capacity and skills to grow the model? Or would it need to be partnered with a larger organisation/network?

1.13 References to quoted research
- Please provide either full references or URLs to key reports quoted in the previous answers here.

Section 2. About your organisation
NOTE: Except where stated, please relate all answers to the lead organisation.

2.1 Name of organisation

2.2 Where is your organisation based?
- Please select from a dropdown box of local authorities. If you organisation is national, please provide the location of your head office.

2.3 Organisation type
- Please select the most appropriate category from: Primary School; Secondary School; Further Education College/6th Form; University; Local Education Authority; Charity; For-profit company; Multi-academy trust/Teaching School Alliance; Community Enterprise Company/Social enterprise; Other.
2.4 Please describe briefly the experience and expertise of the project team (Max. 400 words)

- The project team is central to ensuring EEF/Wellcome funds are well spent and the project has the maximum impact. We would like to know about them and their track record in this area (e.g. recruiting schools to projects, managing complex projects, working with partners and engaging with schools and teachers).

2.5 Please give the name and a brief description of any partner organisations that will contribute to this project (Max. 200 words in total)

- Please indicate what role the partner organisation(s) will play in the proposed project. It is not necessary to list the schools you hope to trial your intervention in, however do indicate any schools or teachers who will be playing a role in developing or delivering the project.

2.6 Application contact name

Please provide the name of the person from the lead organisation who will act as the main point of contact.

2.7 Application contact email address

2.8 Application contact telephone number

2.9 Application contact role/position

Section 3: Finances

3.1 What is the estimated cost per school of your intervention? (Maximum 50 words)

- If you already provide the intervention to schools and pupils please indicate how much it costs per school/pupil.
- If you don’t currently offer the intervention to schools and pupils please estimate how much you think it would cost per school/pupil if you were to offer it at scale.
- This estimate should not include the additional costs that result from participating in an evaluation (e.g. recruitment of schools, liaison with evaluator).
- We are looking for projects that can be funded from schools’ Pupil Premium (currently £1,300 per primary-aged pupil, £935 per secondary-aged pupil).

3.2 Approximately how many schools/settings do you intend to work with?

- Please note that we ask that applicants are willing to be flexible on the exact scale and delivery model, in order to ensure that a robust evaluation can be undertaken. We work with successful applicants and an external evaluator to jointly design a project and evaluation plan. However, it is useful to have an indication of the numbers of schools that you are intending to work with.

3.3 How much funding from the EEF and Wellcome are you seeking in total? (Max. 100 words)

- If possible, please break the budget down into 5 broad types of costs:
  - Intervention development
  - School recruitment
  - Intervention delivery (e.g. training, resources)
  - Project management and admin
  - Other (please specify)

- A more detailed budget is not required at this stage; project budgets often change substantially once we begin working with successful applicants. For example, we may wish to change the number of schools involved in the project in order to get a more
robust estimate of its impact. We will ask for a more detailed budget breakdown if your application progresses to later stages of the process.

- You do not need to include costs of running the evaluation – the EEF will commission an external research team who will be responsible for designing and delivering the evaluation, in partnership with you.

### 3.4 What funding are you intending to secure from other sources? (Max. 100 words)

- To enable us to continue funding innovative, evidence-based ideas we normally expect all applicants to apply with a contribution within the range of 5% to 50% of the overall programme costs, or to be able to commit to fundraising for such a contribution. Please include in your application your plan for identifying this contribution. If there are particular reasons why you think you will be unable to do this, please let us know.
- For profit applicants are expected to substantially subsidise the project cost.
- School or local authority applicants do not need to secure funding from other sources. We typically expect schools participating in trials to contribute to the implementation of the project where appropriate (for example, paying a subsidised fee for the intervention).
- If you have approached, or are considering approaching, any other organisations to seek funding for this project, please outline these organisations and the amounts sought here.

### Section 4: Other funding opportunities and events

4.1 Are you happy to hear from the Wellcome Trust directly about other funding opportunities or events?

- Yes/no