

**RCUK PUBLIC ENGAGEMENT WITH RESEARCH:
SCHOOL-UNIVERSITY PARTNERSHIPS INITIATIVE (SUPI)**

FINAL REPORT - IMPERIAL COLLEGE LONDON

SUPI PROJECT NAME: Imperial College London: Reaching Further

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1: THE 'STORY' OF YOUR SUPI PROJECT

a) Please provide a narrative summary that describes the journey your SUPI project has taken from beginning to end and covering all the key developments in between.

Background

Reaching Further began as a pilot programme developed by Professor Sara Rankin in collaboration with the Reach Out Lab at Imperial College London and Alan West MBE of Exscitec. The basis of the project came from discussions with the Imperial academic community following the publication of the [2002 'SET for Success'](#) report that highlighted concerns about development of transferrable skills within the community of early career researchers. Training motivated researchers to deliver hands-on STEM activities for school students has been at the heart of the Reaching Further programme since its inception. Funding from RCUK's School University Partnership Initiative (SUPI) over the last four years enabled the programme to grow and develop to encompass deeper relationships with partner schools and with a larger number of researchers, focusing specifically on engaging school pupils and teachers with activities linked to current research topics.

Reaching Further as a School and University Partnership

Between 2013 – 2017 Reaching Further was funded as one of thirteen projects within the School University Partnerships Initiative. Forming and formalising solid partnerships with key schools in Greater London was the first priority, keeping in mind the aims and objectives set by the funder, as well as the key stakeholders and academics involved. The aims and objectives are summarised in Appendix 1. At the beginning of Imperial SUPI's journey, the programme was managed in partnership between the University and an external outreach provider, overseen by the College's Outreach team. This model had been used at Imperial for a number of years but halfway through the period of funding, this relationship drew to a close. The contract continued during the third year of SUPI project funding, but in the final year the project was solely coordinated and managed within the Outreach team at Imperial. Over the course of the programme, Reaching Further started to initiate a culture change at Imperial: new programmes have benefited from the feedback and learning around managing school relationships, researchers felt more confident about models of working in schools and researchers are increasingly better equipped to communicate the interconnectedness of inspirational research and education to the public, including children from a range of different backgrounds. The programme informed a new College strategy for societal engagement under the banner of 'sharing the wonder'.

Partnership Management

The partnership between the university and schools was initially managed via formal termly meetings. Senior school staff and the academic leads (PI and Co-I's) formed a project steering board, and school science lead teachers and operational staff from the university formed a working group. This model worked well at the start of the project, and engagement from all stakeholders was high. As the project gathered momentum, this management model became less effective and was cumbersome to organise, which prompted a rethink of how to manage the partnerships especially when the programme management structure moved in-house for the final year. During this handover period, the School Partnerships Coordinator visited each school and most teachers fed back that they would prefer to correspond via email, phone or at the school, rather than attending meetings due to the time commitment involved. The partnership management thus moved away from steering and operational meetings to one-to-one meetings and individualised communication with each school. This model gave the project coordinator the opportunity to form strong and fruitful relationships with the teachers and the schools. Each of the schools involved within the project is different – based in a different location within London, with a different demographic of students, different management structures and different school resources: recognising this was key to building and maintaining those relationships.

Engaging Researchers

For the first three years of funding, the Imperial SUPI was organised into six-monthly cycles of activity, with each cycle beginning in October or February of each year. In each cycle, new cohorts of researchers were recruited, underwent training, developed their activities and delivered them in the partner schools. In the first year of funding, recruitment was excellent and a good number of researchers engaged with the project. As the project moved into the next two years researcher engagement declined, as can be seen from the summary in section 2c of this report. It was not clear why this was the case – the same advertising and recruitment strategies were used as in the first year, and the model of training and support was the same, but the decline prompted a rethink into the model for engaging researchers.

After discussion with project Co-I's, teachers, and researchers who had taken part in the first two years of the programme, the decision was made to evolve the programme into an annual cycle starting in January. Initial advertising and expressions of interest were gathered late during the autumn term, which was followed by significant publicising and a recruitment campaign. The coordination team used contacts within departments and promoted the programme widely across the College, focussing on how training in transferrable skills. Between late January and mid-February those who registered were invited to a project information evening and training sessions. Following this, the researchers continued to develop their activities, utilising drop-in sessions with the Outreach team and direct contact with teachers to finalise their plans. The yearly cycle model afforded the researchers the time and space to work at their own pace, whereas the six monthly model had potentially put more pressure on the researchers. Most researchers were ready to go into schools by mid-April but school visits were not possible until June due to holiday and exam period clashes. Despite this, a significant number of activities took place prior to the summer holidays. It was also found that the long summer break caused some disengagement – it was much harder to get researchers re-engaged after the school holidays and, as a result, some of the promising activities didn't get into schools using this yearly cycle. Consequently, the project team would strongly favour options that involve engaging researchers on a yearly cycle beginning in October and re-aligning the activity alongside the school year (as discussed in more depth in section 2b).

School Activity Models

From the beginning of the programme the model of activity at schools was relatively flexible – leaving the scheduling of the events at the discretion of the school for the most part. Initially, most researcher visits to schools were planned as 'one-off' events, where the external project team liaised directly with the teachers to set up visits within normal school lessons. This worked relatively well and a large number of visits were planned that suited both the researchers' scheduling and the schools', but it was labour intensive on both sides of the partnership. As the project moved forwards, a number of the partner schools wanted to investigate different options, and in the second and third year of the programme some of the schools moved to having larger scale events with multiple activities and researchers visiting per day. This was easier to plan and arrange for both sides of the partnership, but possibly limited the number of activities that were utilised and led to a decrease in the pool of available days for engaging researchers. During the final year, the types of events that ran within the SUP were varied – a couple of the schools offered larger, one-day STEM events, and some of the schools preferred the smaller, one-off style visits.

Hub and Spoke Model of Activities

One of the key priorities for the university was to build on the Hub and Spoke model of engagement with schools that had begun in the pilot stage of Reaching Further. The proposal was to use key schools around London as satellite centres for activity and for those schools to invite their local schools to engage with the activities happening on their site. Whilst the model enables geographic spread and creates a community of teachers and schools supporting one another, it does require the hub schools to undertake significant facilitation. In practice, this only worked in a handful of instances where the hub schools had more existing resources (e.g. staff time and available space).

Evaluation

The approach to evaluation has been consistently robust, throughout the funding period. In all other outreach programmes, Imperial considers a number of factors in its evaluation approach:

- Pupil destination, through tracking with pupil unique identifiers
- Pupil event feedback, providing information on the activity content, event structure and the activity leader
- Teacher feedback, either via surveys or follow up questions post-event

The Reaching Further initiative used the same model of evaluation, and where possible the coordination team gathered the data via surveys at the events or through follow up conversations with teachers. The response rate was variable throughout, which is discussed in more detail in section 2a and 3a. Early in the final year of the programme, an attempt was made to gather pupil feedback online after the activities, but this was abandoned quickly as pupils did not complete the online surveys and no data was gathered; the team then reverted back to paper forms.

In summary, the Reaching Further programme has been an exciting journey of discovery and refinement throughout its four years of operation. It has solidified relationships with key schools, embedded learning on both sides of the partnership, and enabled the HEI team to develop new ways of working with, and sustaining deeper relationships with teachers. Learning to adapt to feedback and implement changes where required has enabled the project to deliver a significant number of novel activities to school pupils and engage with a wide community of researchers across the College. Imperial will continue to build on these lessons for future school engagement activities.

a) Please list the key findings from your SUPI project

Over the years since Reaching Further was implemented, we have seen several key outcomes, relating to the three main stakeholders: The Researchers, the Teachers and the Pupils (detailed below). Whilst data collection was patchy in the early years under the previous project team, as time progressed, we were able to see how the SUPI was valuable in creating lasting long-term relationships with schools. Furthermore, out of Reaching Further, we were able to create two internally funded PhD studentships to continue the research into STEM pedagogy and science literacy. In designing our research proposals, it was abundantly clear that the most effective measure of what we do in schools is whether we improve this perceived concept of 'science literacy' and the attitudes towards science amongst non-scientists. However, this requires a much longer-term study which we are currently undertaking. All of this activity has come from the legacy of the Imperial SUPI

Engaging with Researchers

The benefit of working with senior academics on outreach programmes is three-fold:

1. They act as positive role models for early career researchers in their departments and can demonstrate the value that engagement in outreach activities has given them as their careers developed. Furthermore they can illustrate how critical the concept of science literacy is in the wider public arena – specifically within schools (for this programme)
2. They act as a conduit for connecting Reaching Further with the early career researchers within their departments and faculties. This helps to create a pipeline of keen researchers for the programme and provides a support network throughout the key stages of the engagement.
3. In the early stages of programme development they act as a viable sounding board for ideas, working with the coordination team and the partner schools to create a vision for a project that meets with everyone's aims and objectives.

All Faculties across College (apart from the Business school which was not used for this programme) engaged well with Reaching Further during the four initial years of operation (Figure 1).

Home Faculty of Researchers Engaged with Reaching Further Y1-4

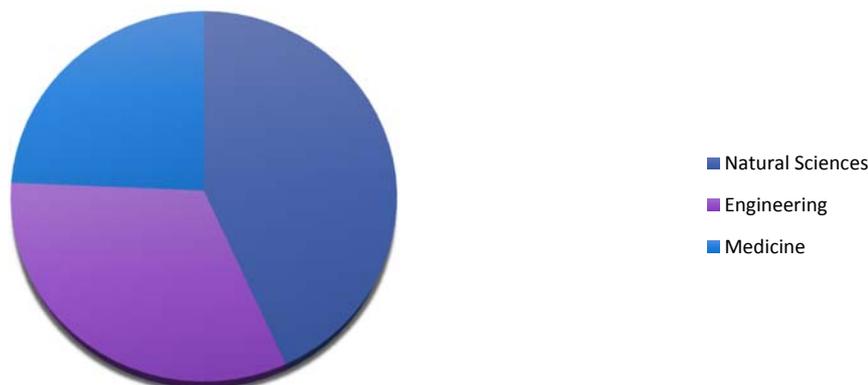


Figure 1 – The graph demonstrates the split between the faculties that researchers were from within the College.

In the first three years of operation, the project was run by a third party organisation on behalf of the College. Engagement from the research community was reasonable for the first year of operation, but it dropped off significantly in year two before rising rapidly when the management was brought in-house to the College's Outreach team. There are likely to be a variety of reasons for this, some of which will be discussed in the next section, but many of the researchers involved in the final year commented that they felt more comfortable working as part of the College's Access and Widening Participation agenda and to support it in its mission to increase science literacy. An additional benefit to the College (through its Athena Swan and gender equality programmes) was the proportion of female researchers engaging with, and completing the project (54%). This was much higher than the proportion of female researchers within the College community (35%) as a whole and demonstrates that Imperial recognises the importance of having strong female role models in supporting female pupils to consider STEM pathways to HE and careers

Engaging with Teachers and Schools

Section 1 described how the relationship between Imperial and the partner schools was modified in the final year of activity to become more informal, after substantial feedback from the schools involved. This has been well recognised by Imperial as a beneficial engagement methodology for projects that have sustained relationships with schools. Having senior management buy-in from schools was also crucial to the success of the programme from the beginning and allowed them an insight into the research potential of the programme. Having senior academics and Outreach staff in those initial discussions with schools demonstrated the importance of the programme to all stakeholders.

It is important to highlight the need for flexibility and honesty when engaging in partnerships of this nature. Both parties should be open and honest about what works and what does not. This was a key learning point for the university coordinating team, especially where schools disengaged later within the project. The scale and momentum of the programme (training the researchers, activities with highly engaged schools etc.) meant that it was difficult to go back and work out what was needed to re-invigorate a dwindling school relationship.

A further point of learning was the realisation that a perceived model of engagement might not actually work out as anticipated. The Hub and Spoke model that the College wished to implement through this project, despite senior leadership buy-in, just didn't work for some schools. They later admitted that they didn't have the resources or time to cascade activities to a wider beneficiary pool. Learning where to invest the energy and resource to make this happen, and where to work at a level that worked for the school, was important and became increasingly apparent to the project team within the final year of the programme. However, a key learning point from this was that the College could take a more pro-active approach to engaging with a wider school population. Through Reaching Further, the Twilight Teacher Focus groups were created to bring STEM teachers in secondary (and primary – in separate sessions) education together to discuss areas of curriculum that they need support with and, furthermore, to learn how HEIs are able to support them.

Engaging with School Students

Overall, the activities seemed well received by the school students who took part with over 89% rating the activities they had taken part in as *good* or *very good*, and 91% rating the researcher as *good* or *very good* as an activity leader. The project also wanted to see whether the activities had impacted on the individuals' aspirations towards HE or towards STEM based subjects and found that 54% reported that they felt more motivated towards their STEM based studies, with 78% felt that they understood why the subjects were important following the activities with the researchers. In terms of aspiration to take up a STEM A-level, 36% of the respondents said they would consider studying a STEM based subject. For those already in KS5, 48% of the respondents indicated that they would consider applying for a STEM related subject at university.

Progression to HE hasn't been possible to determine yet, but we are able to report that 95 eligible students from the programme applied to Imperial College London. It is not possible to measure whether this is as a direct result of taking part in this activity because there are many competing factors that influence what and where students choose to apply to study. However we plan to direct more research into this and to look at the driving forces behind a pupil's higher education decision and ultimate outcome.

Feedback from teachers has highlighted other benefits to their students, not just academic outcomes. In our Y3 report, we wrote that teachers had commented on their students being very engaged with the researchers – asking questions about career paths, relevance of their research to real-life situations, and widening their perspectives that being good at science does not just mean applying to Medicine at university. Furthermore, the school students' science literacy was broadened through engagement in Reaching Further simply by means of exposing them to current research themes that then underpin their curriculum knowledge.

b) Please list the most important learning points from your SUPI project

A key learning point was the role that **listening and communication** has in developing sustainable partnerships. This was fundamental to the smooth running of the programme and we found that a **single point of contact** within both the school and university was the most effective method of coordination. There is a proviso in that senior management backing, at least in the initial stages and during monitoring periods, is crucial, as projects of this type require significant time and human resource. In the school partnerships that failed to get off the ground, it was undoubtedly a lack of internal communication and senior management buy-in that was the cause. Furthermore, keeping **lines of communication** simple and regular is also key to sustaining projects of this type. We found that moving from formal meetings to 1:2:1 in-school meetings was hugely beneficial when the project was up and running.

Another learning point was how important a **flexible approach** is when working on multi-disciplinary partnership programmes. Being **adaptable and resilient** are two key skills that the project team tried to instil in the researchers as part of their training and project development processes. Pupils also learn the importance of being adaptable and resilient when taking part in the activities and it's a good point for them to learn this life skill. Being able to demonstrate adaptability and resilience as a core part of research helps the pupils to understand what skills are needed to become a researcher. It was also important for the coordination team to be flexible when working with the schools to ensure that the activities can fit into their plans and recognising that **one size doesn't fit all**. The project started off focusing on smaller, lesson based activities and some schools then wished to run larger events for multiple pupils. Indications were for the final year that most schools would want to take this larger-event approach, but this was not the case, and the resulting activities for the final year were a mix of smaller, lesson based activities, and larger STEM days. There are pros and cons to each style of event and flexibility enables a school to work within the parameters of its own structure, culture, and pupils. A **mixture of initiatives** (lighter touch and deeper engagements) is good for both parties.

The limited **alignment** between the school and the academic timetable within universities has been a particular challenge, especially in a programme that is funded on a calendar year. As an established Outreach team, who have been working with schools for many years, this was less of a challenge than it may be for embryonic projects and partnerships. This was managed early in the programme by working alongside the schools to try to align the programme structure within their constraints, but continual monitoring and modifications were required to keep things on track. This was a particular challenge when the project was aiming for two cycles of activity per year but the move to one annual cycle mitigated against this to some extent and, going forwards, initiatives will align with the academic year. Cascading activities within the proposed **Hub and Spoke** model proved to be a real challenge and sticking point. Only two of the schools successfully managed to implement this model of engagement, and these were schools that operated in less challenging circumstances. The events that the two schools ran were very successful and indicated that the model can work well, but it was important for the project coordination team to realise that this is not applicable across many schools: again, one size does not fit all.

One of the key goals of all partners was to develop some aspect of the programme that focused on engagement with research within **maths**, and / or to look at where aspects of maths could be pulled into the activities being developed by the researchers. There was limited success with this because researchers from the maths department were very hard to engage. On reflection, this might be due to the use of the word 'science' rather than 'STEM' in the promotional material for departments which should possibly have been more explicit about maths. This was an unexpected learning point and one that the project team has already started to address in their communications and promotional material. **Maintaining momentum** in projects that span an academic year is difficult, and this is amplified when working with the same partners (as we did in some cases) over four years. There are challenges that come from both the relationship between the school and the university, and from working with the researchers. The project team feel that honesty and open lines of communication, as well as regular updates can mitigate against this. When working with the teachers, we found that by having them involved in the researcher-training programme, they gained an insight into and an appreciation for the time it took to develop an activity. They had met and supported the researchers in at the start and continued that relationship for a sustained period, all of which helped with their engagement and expectations as to when we could get the in-school parts of the programme up and running. Likewise for the researchers, keeping the momentum when they were back in their usual day-to-day routine was hard, but offering them lots of opportunities to drop in, or to test experiments, as well as regular email updates seemed to work well. It takes a considerable amount of time and commitment to build a pipeline of actively engaged researchers, which the project team feel that they now have.

During the programme, there have been significant **curriculum changes** within schools, of which we are still only in the midst. It will take time before we fully understand the long-term effect on schools, but we are already seeing some impact on levels of engagement across all of our Outreach programmes due to more pressure on lesson times and the change to linear exams over a two-year period. This is likely to reduce the willingness of schools to adopt extracurricular sessions, without direct links and benefits to the curriculum. In turn, therefore, this will make it harder for schools and teachers to justify the time and resources that are needed to participate in programmes like Reaching Further, limiting the opportunity for partnerships to be sustained with such a diverse range of schools.

c) Please list all engagement activities that were developed and run during your SUPI project

These are grouped into three sections – researcher training, schools' activities and teacher focus groups. These have been grouped together based on the recipient of the engagement.

Training for Researchers

A core part of the Imperial SUPI was focused on supporting the development of transferable skills within the researcher community at the College. It was critical to support the researchers in their SUPI journey and the mechanism for doing so was bespoke training. The training was created in-house using the expertise of Outreach staff and the Graduate School and regularly reviewed and refined during the funding period (more information can be found in section 8 of this report). The training package was supplemented by additional one-to-one support from the project coordinator after the formal training had taken place. At each training session, the researchers had the opportunity to talk to engagement practitioners and current partner teachers to enable them to get a complete perspective on engagement with schools. The training package offered to the researchers was documented in one of our case studies in our Y4 report, and is summarised in Appendix 2.

During the final year of operation, all training sessions were held as twilight meetings and were themed as follows:

- **Session 1 – Induction:** This included an introduction to the programme, an overview of the UK school system including correlating pupil age with school year and key stage, sharing of experiences from previous researchers who had taken part in the programme and an initial brainstorming of ideas. There was also a talk from a member of the Educational Development Unit on how to maximize the researchers' experiences for their career and the benefits of applying for a Fellowship of the HEA. At the end of this session, researchers were asked to start thinking about ideas for their activity ready to share these at the next session.
- **Session 2 - Ideas Sharing:** Teachers from partner schools were invited to attend this session and researchers were split into groups based broadly on their research area to discuss their initial ideas for an activity. Teachers were able to give advice regarding the most appropriate age/year group for the activities and also where there were links with the curriculum. This was an informal session focusing on discussion and sharing of ideas and tips for how to engage students. Teachers were keen to share their experiences of having these types of activities running with their students and were an invaluable source of inspiration for the researchers. At the end of this session, researchers were asked to plan out their activities with a view to showcasing these for the whole group in the final training session.
- **Session 3 - Peer Review:** Researchers, or groups of researchers, presented their activities to the rest of the group including their peers, teachers and members of the Outreach team for review. These were shortened versions of the final activity with an overview of how they would organize it when delivering to a class of school pupils. Teachers were able to give an insight into the type of equipment and spaces available at their schools and ideas on how to keep pupils engaged and involved in the activities. At the end of this session, researchers were asked to finalise the development of their activity in response to the feedback and then meet with the project coordinator or another member of the Outreach team to ensure they were ready to go into schools.
- **Drop-in sessions:** These happened once a week for the duration of the training schedule (6 weeks in total) and were a chance for researchers to meet one to one with the project coordinator to discuss their activities or try things out in the lab. This was particularly beneficial for those that were not able to come to the formal twilight training sessions or those that had specific questions about their activities.

Activities in Schools

Across the four years that the project has been in operation, there have been multiple activities delivered in collaboration as a result of the Imperial SUPI. These have predominately taken place in schools, but a number have also been utilised as part of other STEM engagement projects within the College. These are summarised below in Tables 1 – 4, grouped by the year of activity and the topic for clarity.

Table 1 – 2013 Activities

Activity Name	Number of engagements	Approximate number of participants
Chemistry		
Chemical Investigations	5	100
Drug Discovery	8	160
Protein Crystallisation	1	10
Engineering		
Are Cyborgs Amongst Us?	12	235

Lets Get Programming!	14	280
Walking Tall	9	180
Physics		
Currents and Sensors	7	130
Angry Birds Live!	1	30
Medicine		
Buzz Busters	5	90

Table 2 – 2014 Activities

Activity Name	Number of engagements	Approximate number of participants
Biology		
Invisible Animals	3	60
A Strawberries Secret	2	55
Medicine		
Augmented Reality in Medicine	4	100
Maths		
Contagion!	5	125

Table 3 – 2015 Activities

Activity Name	Number of engagements	Approximate number of participants
Biology		
Life in Leaf Litter	2	60
Structural View of Biology	4	60
Maths		
Polyhedra and Symmetry	1	20
Physics		
Our Expanding Universe	2	20
Space Impact	2	35

Table 4 – 2016 Activities

Activity Name	Number of engagements	Approximate number of participants
Physics		
Solar Energy; The Efficiency Challenge	4	60
How Strong is a baby's kick?	3	50
Engineering		
Natural Fibre Composites and Our Planet	1	25
Musculoskeletal Biomechanics and Its Basis in High School Physics	3	55
Chemistry		
Rates of Reaction	4	50

Biology		
Brain Games: Exploring the World of Neuroscience	1	20
Heart: The Clever Muscle	1	20
Paleontological puzzles	1	100
Life Cycle of Yeast	2	50

Teacher Meets and Focus Groups

One of the key performance indicators of the SUPI was an effective engagement with teachers on a deeper, more fundamental level that developed within the institution as a direct result of the SUPI. The formal project steering and coordination meetings naturally evolved into ad-hoc communication and discussion as the project developed, as discussed in sections 1 and 2b. However, the project team found that in the early stages of the project, these comprehensive teacher meetings were invaluable in shaping the direction of the programme – an outcome that has been employed throughout many of our other activities at Imperial.

Consequently, the SUPI has led the team to undertake termly teacher focus groups – these have grown out of the Reaching Further relationships to generate and sustain a truly collaborative method of working with teachers, with an emphasis on two-way dialogue. Through Reaching Further and the continuation of these focus groups, the project team has come to appreciate the value of bringing teachers into the university to learn from them. This has increased the synergies between traditional Outreach work and the school curriculum, without constraint or being too focused on either party's own agenda.

Over the last year, the Outreach team has held multiple focus groups, often aligned with some of the SUPI aims and objectives. In late 2015 the focus was on Outreach activities for schools and students and selection processes for widening participation activities. There was also discussion on teacher CPD opportunities, and this conversation also continued into 2017 as the team continues to scope out how the university can support teacher development further. In early 2016 the focus groups mainly reflected on changes to the KS4 and KS5 curricula, and where universities might be able to support schools. This linked in very nicely with our particular SUPI programme, and again this topic has continued with the 2017 focus groups. The team has also held a number of Primary level focus groups which have focused on Maths for high achievers, Outreach science resources and CPD opportunities for teachers – both online and in person.

3: THE IMPACT AND INFLUENCE OF YOUR SUPI PROJECT

a) Please summarise the impact(s) of your SUPI project across its lifetime

Any engagement project will impact on a number of different audiences, and in a variety of ways – some of which depends on what the audience's rationale was for engaging in the first place. For this section of the report, we have split this to focus on the impact on each type of stakeholder.

Impact on School Students

The programme aimed to engage school students with cutting-edge research and expand their appreciation of research, and through this, to enhance their understanding and confidence in STEM subjects. This is all broadly wrapped up as an attempting to see an increase in the pupils' science literacy and 'science capital'. It was hoped that being part of this project would aid pupil aspiration into study and careers within STEM, by demonstrating the multiple avenues that studying maths and the sciences can lead to.

The results of the student surveys were outlined in section 2a, and indicated that 48% of responding students in KS5 and 36% of students in KS3 or KS4 would consider studying STEM related subjects at the next stage of their academic career. Furthermore, 54% of respondents reported feeling more motivated following their activity and 78% reported that they understood the importance of the subject matter, indicating that the activities did support the students in that area and were successful in meeting their envisaged aims.

Overall, the project team has recorded nearly 1,150 named student participants in the programme, but the actual number of beneficiaries is believed to be over 2,100 when we take into account those who didn't provide their tracking information. Of these students, over 160 were the recipient of more than one activity engaging with the researchers. Difficulties in gaining survey data from activities in schools meant that we could not always get a full picture of the scope of the measurable impact on the students. However, schoolteachers have reported anecdotally that the students benefitted on a wider level from the activities and from having a researcher in school. Data collection was improved in

the final year with the onus placed onto the researcher to gather the feedback, thus enabling them to gain immediate reactions to their engagement as well as improving the response rate of the surveys.

Gaining a broad response from a survey designed to gather quantitative feedback has its limitations and so the project team sought to gather qualitative feedback where possible as well. It is clear from this that the students have enjoyed the opportunity to do something different when working with the researchers, and a small selection of comments from some activities that took place in June 2016 are featured below (Figure 2) as an example of the types of feedback received when students were asked what they particularly enjoyed about the activity. Some additional responses are also highlighted in Appendix 3.



Figure 2 – Sample of student free text comments from June 2016 activities

Impact on Schools and Teachers

As part of the programme we wanted to work with teachers to build their knowledge and understanding of contemporary research issues. Whilst this was not necessarily a core part of the Reaching Further programme initially, it was enhanced by the LSEF funding that was leveraged alongside this allocation. This additional funding made it possible for us to interact with nearly 400 teachers across 99 workshops during 2014 and 2015. The aim of the programme was to impact teacher confidence and knowledge in STEM topics outside of their specialism, and to support them, and we found that overall, teachers reported an increase in confidence following their interventions, and that teacher's subject knowledge increased in the topic areas tested. Anecdotal feedback indicated that teachers felt more confident about being able to take new content, and activities based on this content, back into their classroom following their workshops. In addition, many reported that the engagement with the researchers was really important to understand the more complex topics in greater context.

Interestingly within the RCUK funded programme, there was professional development 'by stealth' reported by some of the teachers. One school reported that seeing the researchers struggle at times in the school environment had a positive impact on the confidence of some of the more inexperienced or under-confident teachers, and another school reported that using NQTs to mentor the researchers had provided them with additional skills that were unexpected. Teachers reported being able to extend and update their knowledge about new developments with science and engineering, and creating links between the scientists and the schools had been beneficial for a number of other in-school initiatives. Having an online repository of activities will provide the teachers with resources to enhance the curriculum and highlight projects to their students who may develop interests outside of their current learning and the Imperial team is currently working on this.

Deepening the relationship between schools and the university enabled the teachers to get to grips with the breadth of opportunities available to their students on other programmes – e.g. taster days, summer schools and work experience. This was enormously beneficial to both parties, but provided the teachers with other avenues to signpost their students to for additional experiences linked to careers and higher education.

Impact on Researchers

One of the results of the SUPI project has been a truly massive impact on attitudes and activities within Imperial amongst academics and researchers. SUPI was an important driver in our establishing a substantial and funded programme of public engagement activities. We now are setting this up as an academically measured activity, and mechanisms for more effective use of our resources. This also includes training the brightest young researchers in aspects of pedagogy and public engagement. The skills developed and honed during SUPI have been an important part of this and our practical work with science engagement is now regarded as a key area which influences researchers and teachers across our campus.

To break this down, it was critical that Reaching Further benefited the research community within Imperial, given how much support academics were offering. The aim was to provide researchers with a different route to support their professional development and transferable skills such as communication, networking and team-working. In addition, we wanted to be able to support the researchers to develop aspects of their studies to make current research themes accessible to the school community. This in turn would then without doubt, support future funding applications within their departments and Faculties.

On gathering reflective feedback from the researchers, it appeared there were a variety of reasons why researchers were interested in being part of the programme. Most wanted to develop an activity that was related to something that they were passionate about to disseminate information and knowledge, whilst others wanted to work specifically with secondary school students to increase science literacy and widen participation and aspirations in STEM. Towards the end of the funding period several researchers also reported that they wanted to get involved because public engagement and outreach was a specific requirement of their funding. It is clear that this message is now becoming more widespread, and that more researchers are looking for a variety of ways to disseminate their work. This is quite a difference compared to the first year where the researchers were reporting more interest in the CPD aspect of the programme, with funding requirements rarely being mentioned.

At the start of the programme, the personal development aspect of the project was done through an on-line learning journal, and whilst some researchers used this, it had a relatively low impact. Those that did use it rated themselves as quite confident in their ability to communicate and project manage. We then began to focus on doing pre- and post-project surveys with the researchers to attempt to determine impact on areas such as:

- Communicating their research to peers
- Communicating their research to school children
- Public engagement
- Developing and delivering an activity for school students
- Time management
- Problem solving
- Resilience

On the whole researchers reported an increase in confidence and in utilising transferable skills (such as communication, time management, prioritisation etc.) especially when asked about developing and delivering activities to schoolchildren. One interesting aspect of working with a small cohort of researchers was following their individual journeys. One of our more timid researchers in our Y4 survey reported large increases in confidence and went on to undertake public engagement at festivals and much larger events, despite initially being '*terrified of speaking to children*'. It is also worth pointing out, however, that, on occasion, projects like these can have the opposite effect on self-reported transferrable skills. Some researchers experience over-confidence when starting out on such projects and then come to the realisation that it is harder than anticipated.

The project team worked with the Educational Development Unit (EDU) within Imperial to support researchers who wished to use their experiences on this project as part of their application for HEA fellowship. Part of the training programme outlined the options available to them with the HEA, and its importance for those who might be considering career routes that have an element of teaching incorporated. Enabling the researchers to apply for a fellowship, which is transferrable within HEI's, gave them the opportunity to gain a career enhancing qualification as well as the transferrable skills already mentioned.

It is also worth highlighting the impact that the project has had on the project coordinators within Imperial. Being part of the SUPI has enabled them to make connections with staff in similar roles in the other participating HEI's, as well as making valuable connections with staff in the NCCPE. This has been much appreciated for their own CPD, as well as

being able to share and collaborate with ideas and best practice at the regular coordination sessions, and it cannot be stressed enough how important this has been for both the projects and the individuals.

b) Please summarise any influence your SUPI project has had on your institution, its culture, or that of any other institutions, cultures and projects/initiatives.

The Imperial SUPI has **enabled stronger and deeper links with the key schools** that we have partnered with during this project. We have been able to **embed them into additional projects and initiatives**, as well as creating a **network of teachers** to be able to have open and honest ideation and knowledge transfer sessions with. It has built trust between the institutions, in many cases, wider than the central team that coordinated the programme.

One very positive impact is the creation of our **teacher focus groups**. The SUPI project gave the coordination team the opportunity to look at engagement with teachers with fresh eyes, and seeing the impact of the in-depth meetings, 1:2:1's and the benefits to having teachers involved with the training programmes at an early stage gave rise to this model being utilised within other programmes. Creating the teacher focus groups (outlined in section 2c) has had huge benefit to the central team, and is now starting to make an impact more widely within the institution, with academic departments utilising them as a means of **communicating with and listening to teachers for initiatives** outside of Outreach, and we firmly believe that this will be a lasting legacy.

Imperial has in the last few years, turned the spotlight to focus on a growing emphasis on **engagement with schools and teachers** as well as with the local and wider community. Whilst we have had an incredibly active Outreach team for many years, SUPI has shifted some of the focus to the **importance of working with the teachers** as well as school students. Prior to SUPI there were few initiatives available for working with teachers, and this project provided the resource to enable direct participation with them, which has led to Imperial being able to understand more clearly what teachers and schools want for their themselves and their pupils. From this, there has been modification to our existing programming, as well as our central team being able to advise and guide academic departments and other sections of the College about being more informed about newer initiatives. The Outreach team is now being approached to help connect to teachers as well as school students indicating that the impact has spread further than just those who are employed work in these areas.

One **specific legacy of this project is two members of staff** within the Outreach team who were employed to work specifically on school partnerships. Whilst neither of them is funded by SUPI, and both work on numerous projects, neither role would have been possible without the **culture change within senior management** within the College, which is a direct result of SUPI. Following the conclusion of SUPI funding, both roles will continue to work on projects that focus on developing and sustaining productive partnerships with schools going forwards.

Connecting Reaching Further to the Higher Education Academy has been a key element of maintain the legacy and also highlighting the importance of researchers' work beyond the lab. We **have successfully nurtured several researchers to date through the fellowship process** to demonstrate the impact of their work and to give them the credit they are due for their hard work and commitment. This then leads to other academics and early career researchers to recognise the importance of engaging in this type of work – which again has been something of a **paradigm shift for Imperial in the last few years**. Without doubt, **the SUPI programme is responsible for this change** of emphasis and we are incredibly proud of how our researchers and staff have been rewarded accordingly (see section 5 below).

'Sharing the wonder of what we do' was a core part of the College's revised strategy, which was launched midway through the period of funding for our SUPI. Whilst the strategy was not linked into the SUPI, it is the result of a **wider culture change within the institution** of which our SUPI project has been a significant part. Within the institution there is more emphasis on projects that engage with the public, with schools, with patients and other stakeholders, as well as more support in terms of training and recognition for staff and students who undertake this type of activity. The team have been able to **leverage funding for activities going forward**, most of which focuses on engagement with teachers as well as pupils, and all of these projects have **working with researchers to support and deliver these programmes** at their core. This is a direct impact of the value that we have seen from this approach via our SUPI.

One of the greatest areas of influences has been in the **researchers' perception of increasing science literacy and also science capital amongst the pupils and teachers** that they have been working with. This concept has meant that pupils and teachers were exposed to **cutting edge research themes that underpin the core curriculum**, making learning fun and relevant and less abstract in many cases. Pupils reported an increased understanding of STEM and, more importantly, how STEM affects the world around them. **Opening their eyes to this has meant opening their minds to different career options and career paths** which they might not have otherwise considered. Researchers found this element hugely rewarding as they felt quite strongly about **the need to widen participation and aspirations in STEM**

from the start. The legacy at the SUPI funding has left at Imperial very much centres around this increase in science literacy in society that is broader than just inspiring students to want to apply for a science degree at Imperial, per se.

Long term, it is hoped that with the legacy of this project and others funded as part of this initiative, the impacts we have reported will be felt by academia and society more widely. Working with the next generation of citizens **to increase science literacy and capital** through a deeper understanding of the process and importance of research, as well as key topics therein, is vital to **creating an informed society within which they are able to make decisions about advances that impact on their lives**. Fostering the importance of engagement with the public within our more junior and early career researchers is equally important – the **ability to communicate their research effectively to ensure it is accessible to society** is an increasingly needed skill for a successful research career, and important for ensuring it remains accessible and attainable for those who aspire to follow in their footsteps.

4: PUBLICATIONS AND PRODUCTS

a) Please list any publications that have resulted from your SUPI project

The Imperial SUPI project has been written into our Access Agreement for 2017/2018 to demonstrate that it is now a core programme that the College is committed to. Furthermore, we are in the process of writing up case studies with one of the schools, with a view to publishing an academic paper on how the teacher-researcher partnership has flourished.

The SUPI initiative has featured in the Outreach annual reports in [2013/2014](#) and 2015/2016 (in press).

One of the schools engaged in the Reaching Further partnership is also part of a curriculum based programme run separately by the Outreach team. Bringing the two programmes together allowed us to bring together the students for an event at the College linked to animal research. There is a [publication online](#) about this visit as well as one on of the researcher activities. (Appendix 4).

The Imperial SUPI contributed to the poster session at the [Engage Conference](#) in late 2016. The poster was focused on the SUPI initiative more widely, shared between numerous institutions.

b) Please list any products e.g. artistic, creative or educational material outputs that have resulted from your SUPI project.

The Imperial SUPI was based on the researchers developing a practical science workshop that could be taught in schools (or other venues) to secondary school students. As a consequence, there are a number of outputs that will be available to use as a project legacy and the project team are working towards forming a repository of these resources on the College website. The current proposal is for these activities to be grouped into subject sections and for schools, teachers and wider stakeholders to have access to these to enable the activities to continue to be used with the intended audience. Each activity pack will contain student worksheets, instructor and technical notes and supporting documentation.

The Reaching Further project was linked to the London Schools Excellence Fund (LSEF) project that is mentioned in section 7. This sought to support London schools through continuing professional development (CPD) for teachers across KS2 – 5. For teachers in KS4 and KS5, there was an opportunity to bring some of the researchers activities to life as CPD sessions for teachers who wanted to add some creativity and research to their classrooms. One of the legacies of the LSEF project is an [online platform](#) for teachers to connect amongst peers and download these resources. In addition, the report from this funded project is also [available online](#).

Using the Hub and Spoke model that was intended as part of Reaching Further, one of the senior academics involved with Reaching Further has successfully implemented a maths-based project for primary schools. This project has utilised a secondary school as the hub school, and the activities have been disseminated to all the local primaries. These resources are also available to [download online](#).

5: AWARDS AND RECOGNITION

Please list any awards or recognition associated with your SUPI project

One of the recent researchers involved with this programme has been awarded Associate Fellowship of the Higher Education Academy (HEA), and another three are in the process of finalising their applications as mentioned above. In addition to the recent successes with HEA fellowship recognition, in 2016 one of the project coordinators was nominated for a President's Award, focused on Societal Engagement Leadership at Imperial College for the work she has undertaken on the programme. During 2017, the project team will be seeking to nominate a couple of the researchers and their activities from this programme of activity in for the same series of awards within the College. If successful, these will be awarded in June 2017.

The project coordinators are also seeking other opportunities to raise awareness of the programme and its outcomes.

6: COLLABORATIONS AND PARTNERSHIP

Please provide details of any significant collaborations and partnerships that have resulted from your SUPI project

The Imperial SUPI formed partnerships with a number of schools during its four years of operation – with two of the initial partner schools continuing for the duration of the project. As the project progressed, the Imperial coordination team formed new partnerships with additional schools that joined during the four years.

Watford Grammar School for Boys and Bacon's College were partnerships that lasted the duration of the project, and new partnerships were formed with Westminster Academy, Twyford CofE High School and William Perkin Academy in the last year of the project. In addition, Kendrick School were a project partner for the first three years of the project. The Imperial project coordination team also collaborated with the Educational Development Unit (EDU) at the College to aid with the transferable skills development within the researcher community engaged with the project. This collaboration will continue with other projects that the Outreach team lead on that involve researcher training, development and engagement.

7: FURTHER FUNDING

Please list all further funding that your SUPI project has leveraged across its lifetime

Imperial College London (Lord Winston and Outreach) and Exscitec (Alan West MBE) were the recipients of **funding from the London Schools Excellent Fund between 2013 and 2015**. This programme was funded jointly by the Department for Education and the Greater London Authority. The cost of running the overall programme of activity was **£667,175 with £498,115 provided by the funder and £169,060 as an in-kind contribution** by the College. A large element of this programme was linked to the **Reaching Further model of engaging researchers with teachers, schools and pupils**.

In addition to this, the **Reaching Further programme received £35,000 per annum from BG Group between 2012-2014** to roll out activities that were generated during the pilot phase of the programme. These activities were all linked to energy solutions and this funding was used to disseminate these activities to schools within the Reading schools hub.

8: SKILLS AND PEOPLE

a) Please list any skills related developments that have taken place as part of, or as a result of your SUPI project

The SUPI at Imperial has, amongst other KPIs, focused on the **development of transferrable skills** within the community of engaged researchers. A core part of the training and development process for the researchers was created specifically for this programme of activity, latterly with the support of the College's EDU department and Graduate School. At the beginning of the programme this training was undertaken by an external project coordination team, but when the programme management was taken in-house in the final year of funding, it enabled the College and central Outreach team to review and modify this after gathering feedback from researchers and other departments within the College. In the final year of the programme all researchers underwent three evening training sessions, aimed at providing them with:

- An overview of the UK schools system, which was especially important for Imperial due to the proportion of researchers who were educated overseas.

- Information on how to maximise their experiences with Outreach for their careers by applying for a Fellowship of the HEA.
- A greater understanding of the College's Access and Widening Participation Agenda and how it aligns to the College's central strategy for 'sharing the wonder'
- Access to teachers from the partner schools for advice on curriculum developments and engaging students, including the role of questioning and the subtleties of breaking down complex concepts into digestible steps.

The project team felt that it was important to **provide the researchers with a holistic and overarching package of training** that provided them with an understanding of the **outreach missions**, an **insight into curriculum pedagogy**, and an **emphasis on the importance of educational continuity** from school to university. As part of this, the researchers were able to consider **broader professional development** by transference of skills to an academic career and broader social awareness of their research.

Researchers were also given practical advice on their activities from their peers, teachers and members of the Outreach team. This is further detailed in section 2c.

Creating this bespoke training package enabled the Outreach team to **form new collaborations** with the Educational Development Unit (EDU) within the College, the Graduate School and the Postdoc Development Centre. This ensured that best practice was implemented and that the training formed part of a coordinated package offered by the College that could be signposted to **all researchers who wished to engage in communicating their research**.

Linking the SUPI training package with the Imperial EDU team provided the researchers with additional professional development opportunities, as the training on offer allowed them to connect into the **Imperial STAR framework, which supports researchers to obtain HEA Fellowship**. Providing the researchers with the opportunity to gain accreditation for their teaching as part of this project began once the management of the programme was taken in-house and to date we have seen a number of our recent researchers begin this process with another **successfully gain Associate Fellowship**.

Outreach and the Imperial Graduate School collaborate on the '*Communicating Research in Schools*' professional skills training course, which was designed to be **an introduction to engaging with schools**. As the programme of school partnership activities moves forward at Imperial following the end of SUPI, the coordination team will be looking to **integrate and embed** the two training courses as a continuum for those researchers who wish to engage with schools more deeply.

The Outreach team also currently run a series of training days for researchers who wish to **teach on Outreach activities within the Wohl Reach Out Lab and on summer schools**. These sessions are **focused on teaching current curriculum content** rather than the development of activities linked to research but cover some of the same transferrable skills and professional development aspects as the training provided as part of the SUP initiative. During the last year of the SUPI at Imperial, the project team have been able to adjust their training packages on the back of feedback gained from those initial SUPI training sessions. **This legacy is important to recognise as a key success of the Imperial SUPI.**

b) Please list any secondments placements and internships to or from other organisations associated with your SUPI project

There is nothing to report in this section.

9: OTHER

Please state here any other information associated with your SUPI project that you would like RCUK to know as part of final reporting.

There is nothing to report in this section.

Summary of Overall Aims and Objectives

1. To systematically roll out the Reaching Further early career research and research student training programme.
2. To train early career researchers in public engagement (PE) techniques and develop PE skills (such as personal effectiveness, communication, presentation skills and creativity).
3. To utilise these skills in the development and delivery of PE activities based on their research for school students.
4. To provide access to the specialist Reach Out Lab facility at Imperial College London for the developed activities to be delivered.
5. To work with partner schools to develop activities that will enhance the STEM curriculum taught in those schools and their affiliate schools.
6. To work with hub schools to provide Outreach links to a wider network of schools and in particular schools operating in challenging circumstances or with students from disadvantaged backgrounds.
7. To deliver the developed activity utilising school facilities.

Stakeholder Objectives

Wohl Reach Out Lab

- To take the Reaching Further concept and extend it by linking with more research groups across the College and within the Faculties represented by the academic Co-Investigators (Medicine, Natural Sciences and Engineering)
- Build on links to three different Faculty interests to generate a number of participant researchers in 2013; continue to recruit participant researchers across the duration of the programme; and to build the total cohort of researcher deliverers through retention year on year
- Expand the reach of the programme through the inclusion of additional satellite school centres to provide more placement opportunities for the Outreach activities

Early Career Researchers

- To provide an accessible pathway to researchers that will support their own professional development and acquisition of key transferable skills (communication, personal effectiveness, networking and team-working) at the same time as delivering a high calibre Outreach intervention that makes a positive contribution to the STEM agenda and the College Mission
- To train ECRs to develop their public engagement skills enabling them to develop aspects of their research activity in a way that makes it accessible to school students and teachers
- To support the training of researchers and the development of deliverable activities that:
 - Address RCUK strategic objectives
 - Mesh with the objectives of Outreach and the wider strategic vision of the College in terms of public engagement and outreach (through the College's Access Agreement)
 - Meet aspects of the professional development needs of participants; enable researchers to deliver public engagement activity related to their own grant funding

Schools

- To work with teachers to build their knowledge and understanding of contemporary research issues through curriculum enrichment
- To build on the concept of using partnership schools around London as satellite centres for outreach activity, led by researchers and supported by the Imperial Outreach Team, and delivery partner Exscitec. Each satellite centre will form the hub for a wider network of schools that will become beneficiaries of the programme
- The partner schools will provide links to other schools (which may be in disadvantaged situations or possibly experiencing a specialist teacher shortage), thereby increasing the scope of established programmes
- To work with at least four school satellite centres in the first year of grant support and, with private sector support, to extend this to at least five centres within the scope of the grant period

Students

- To optimise school students' engagement with cutting edge research, enhancing their understanding of science, engineering and medicine and raising self-esteem in STEM subjects (at school and beyond) leading to HEI applications and highlighting research as a viable career option
- To extend the pool of female academics, engaging as role models, an issue that had been raised by Professor Welton

Case Study: The Training and Development Process in more detail

One aspect of the Imperial SUPI that the project team is particularly happy with in this final year is the success of the development and training programme for researchers on the project.

The training and support on offer was varied and wide reaching. As a University with a high proportion of international students and staff, it was key to the success of the programme to provide the researchers with an initial information evening that comprised of information and guidance about the UK school system. Rebecca, the project coordinator said: *“We wanted to provide the researchers with an accurate idea of the school contexts they were likely to encounter, and to give them ideas about the curriculum framework their activity was going to be seen within but without restricting their thinking or (as is easily the case) presenting the school context as a series of barriers.”*

A current teacher also provided information on how they would approach the development of a lesson for their classes, in terms of how to understand the students’ learning context, differentiating the teaching approaches for different learner needs and behaviour management. He explained that *“the researchers told me afterwards that they found this section very reassuring – we were very clear that it wasn’t their role to manage the behaviour of the classrooms they would be teaching in, but this was a key concern of researchers who might have had some negative expectations of London schools.”*

Two researchers that had previously taken part in the project also came along to this first session to share their experience of developing and delivering an activity in schools. This was particularly useful to those researchers that were less confident in working with school children.

Alex, one of the researchers engaged in a solar cell project reported: *“The earlier, more general sessions, gave us an idea of what the useful outcomes of a school activity might be, for both the children and us. We were particularly interested in a comment from a previous programme participant: ‘the activities should aim to enthuse as much as educate’. This helped us to frame the main goals of our activity.”*

Additionally, time in the initial sessions was allocated to informing the researchers on how to link their experiences on the programme into an application for HEA Fellowship, including how the project and the project team could support them with their applications if desired. To date, from this year’s cohort of researchers there has been one fellowship awarded, and another four applications in progress.

The training did not stop there – researchers and teachers from partner schools were invited to take part in a further two development and training sessions. A key focus of the latter sessions was grouping researchers and teachers together to brain storm and share experiences in a reciprocal manner. The feedback from the researchers was very positive as to how this specifically helped the development of their confidence and activity. Stefaan mentioned: *“Particularly useful was the chance to chat directly with teachers, as they provided us with lots of tips for engaging with students and for tying our research in with the school curriculum. My school visits were very successful, with lots of great feedback from the students and teachers”*. This was reiterated by Alex: *“In later sessions, we were able to pitch our activity to teachers and receive feedback. Here we got some useful logistical advice on how to deliver the session, manage the time, what age group to aim at, etc. Perhaps the most important advice we received here was that we should not expect everything to go as planned, and that we needed to be flexible and spontaneous and allow the activity to change and reinvent itself during a session depending on how the children reacted. This turned out to be very true. By our third session we became quite good at this and were inventing new sub-activities in the middle of a session.”*

The team felt that it would be important to set-up additional drop in sessions for researchers. A commonly reported need of the researchers on past years of the programmes was flexibility in training to help them cope with competing demands on their time – so every Wednesday afternoon, the project coordinator was available in the lab for researchers to drop in and to discuss their concerns, try out small activities and run through experiments. This was appreciated by the researchers involved, with Stefaan telling us: *“The Outreach team provided fantastic support throughout the process, with members making themselves available for both individual and group sessions to develop our activities and lesson plans. We were also able to drop in at any time to collect equipment, or to chat about our experiences and feedback.”*

It is clear that motivation from the researchers is a key part of the programme, and that the outcomes from the programme in turn are linked to the support provided to them during the training process and drop in sessions. Researcher feedback enables the project team to see both of these factors at play. For example:

"I took part in the Imperial College Wohl Reach Out Lab's Reaching Further project in order to engage and inspire students, and to develop my teaching skills. The Lab provided fantastic support throughout the process, with members making themselves available for both individual and group sessions to develop our activities and lesson plans. We were also able to drop in at any time to collect equipment, or to chat about our experiences and feedback."

"We planned to deliver an activity to year 9-10 children based on solar energy, which is the topic of our research group. We had some outreach material and ideas already prepared for the Imperial Festival; however what we had prepared was in the format of a stall, not an activity, and was aimed at a broader age range. The Reach Out training sessions helped us to transform this into a one-hour activity to take to schools, and also gave us some ideas for adding new material."

Overall the project team feel that the investment in the training and development of researchers, with active involvement from the partner schools, has underpinned the success of the programme, and it is an area that has particularly thrived within the final year.

